

At a Meeting of the Council  
of the *Royal Society*,  
June 24. 1675.

*Ordered,*

**T**HAT a Discourse, made  
before the Royal Socie-  
ty the 29<sup>th</sup> of April, and 13<sup>th</sup> of  
May 1675. by John Evelyn  
Esquire, concerning *Agricul-  
ture*, be printed by the Printer  
of the said Society.

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A  
Philosophical Discourse  
*Will: O F Fowler*  
EARTH,

Relating to the  
*Culture and Improvement of*  
it for *Vegetation*, and the *Propa-*  
*gation of Plants, &c.* as it was  
presented to the *Royal Society*,  
*April 29. 1675.*

By *J. Evelyn Esq; Fellow of the said*  
*SOCIETY.*

Πόλλακι τὸι κητωρὲς ἀνθρ καὶ ἀναίρειον ὄντι.

L O N D O N,  
Printed for *John Martyn*, Printer to  
the *Royal Society.* 1676.



To the *Right Honourable* My Lord Viscount  
*Brouncker, &c.* President of the *Royal Society, &c.*

My Lord,

**I** Have in obedience to  
your Lordship, and the  
irresistible Suffrages of  
that Society over which  
you preside, resign'd these Pa-  
pers to be dispos'd of, as you  
think fit: I hear your Lord-  
ships sentence is, they should  
be made Publick. Why should  
not a thousand Things of infi-  
nitely more value, daily en-  
riching their Collection (and  
A 3 which

## The Dedication.

*which would better justify the  
laudable progress of that As-  
sembly) be oftner produc'd,  
as some of late have been?  
This, my Lord, would obvi-  
ate all unkind Objections, and  
cover the Infirmities of the  
present Discourse, with things  
indeed worthy its Institution.  
But, as I am to obey your  
Lordships Commands, so both  
your Lordship and the Socie-  
ty are redevable for publishing  
the Imperfections of*

*My Lord,  
Your Lordships  
and Their most obedient  
Servant*

**J. EVELYN.**

A

*Philosophical Discourse*

OF

E A R T H.

I AM call'd upon, by Command from your *Lordship*, and the Council, who direct the progress of the *Royal Society* (and as in course it falls) to entertain this Illustrious Assembly with something, which being either deduced from, or leading to *Philosophical Experiment*, may be of real use, and suitable to the design of its Institution.

I am highly sensible, as of the honour which is done me, so of the great disadvantages I lye under, for want of abilities to carry

me through an undertaking of this importance, and before such acute and learned Judges; but I hope, my obedience to your Commands, and, at least, endeavours, will cover those defects for which I can make no other Apology.

There are few here, I presume, who know not upon how innocent and humble a subject I have long since diverted my thoughts; and therefore, I hope, they will not be displeased, or think it unworthy of their patience, if from their more sublime and noble speculations (and which do often carry them to converse among the brighter Orbs, and Heavenly Bodies) they descend a while, and fix their eyes upon the *Earth*, which I make the present Argument of my Discourse. I had once indeed pitch'd upon a Subject of somewhat a more brisk and lively nature; for what is there

there in Nature so sluggish and dull as Earth? What more spiritual and active, than *Vegetation*, and what the Earth produces? But *this*, as a Province becoming a more steady hand, and penetrating wit, than mine to cultivate (unless where it transitorily comes in my way to speak of *Salts* and *Ferments*) I leave to those of this learned Society, who have already given such admirable Essays of what they will be more able to accomplish upon that useful and curious Theme; and therefore I beg leave, that I may confine my self to my more proper Element, the *Earth*, which though the lowest, and most inferior of them all, is yet so subservient, and necessary to *Vegetation*, as without it there could hardly be any such thing in Nature.

To begin, I shall in the first place then describe, what I mean  
by

by *Earth*; then I shall endeavour to shew you the *several sorts* and kinds of *Earth*; and lastly, how we may best *improve* it to the Uses of the *Husbandman*, the *Forrester*, and the *Gardner*, which is indeed of large and profitable extent, though it be but poor and mean in sound, compar'd to Mines of Gold and Silver, and other rich *Ores*, which likewise are the Treasures of the *Earth*, but less innocent and useful.

I intend not here to amuse this noble Audience, or my self, with those nice enquiries, concerning what the real *Form* of that Body, or Substance is, which we call *Earth*, denudated and stripp'd of all *Heterogeneity*, and reduc'd to its principles, as whether it be composed of sandy, central, nitrous, or other Salts, Atoms, and Particles? Whether void of all qualities but dryness, and the like (as they commonly enter  
into



into the several definitions of *Philosophers*,) nor of what Figure and Contexture it consists, which causes it to adhere and combine together, so as to affirm any thing dogmatically thereupon; much less shall I contend, whether it be a *Planet* moving about the *Sun*, or be fixt in the Center of the Universe; all which have been the curious researches and verifications of our later Theorists, but content my self with that Body or Mass of Gleab, which we both dwell on, and every day cultivate for our necessary subsistence, as it affords us *Corn*, *Trees*, *Plants*, and other *Vegetables* of all sorts, useful for humane life, or the innocent refreshments of it.

Those who have written *de Arte Combinatoria*, reckon of no fewer than One hundred seventy nine millions one thousand and sixty different sorts of Earths; but of all this enormous number, as  
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of all other good things, it seems they do not acquaint us with above eight or nine eminently useful to our purpose; and truly, I can hardly yet arrive at so many. Such as I find naturally and usually to rise from the Pit, I shall here spread before you in their order.

The most beneficial sort of Mould or Earth, appearing on the surface (for we shall not at present penetrate lower than is necessary for the planting and propagation of Vegetables) as it consists of a mixt body, is the *natural* (as I beg leave to call it) *under-turf-Earth*, and the rest which commonly succeeds it, in *strata's*, or layers, 'till we arrive to the barren, and impenetrable Rock, be it fat or lean, *Loam*, *Clay*, *Plastic*, *Figuline*, or *Sme-tic*; as *Chalk*, *Marle*, *Fullers-Earth*, *Sandy*, *Gravelly*, *Stony*, *Rock*, *Shelly*, *Coal*, or *Mineral*; such

such as with the Ancients were the *Creta*, *Argilla*, *Smeſtica*, *Tophacea*, *Pulla*, *Alba*, *Rufa*, *Columbina*, *Macra*, *Cariosa*, *Rubrica* (I name them promiſcuouſly) to be found in the old *Geoponic* Authors, to whom I refer the Critical.

Moſt, or all, of theſe lying (as I affirm'd) in Beds, one upon another, from ſofter to harder, better to worſe, uſually determine in Sand, Gravel, Stone, Rock, or Shell, which *laſt* we frequently meet with in Maſh and Fenny Delves, and ſometimes even at the foot of high Mountains, after divers ſucceſſions of different Moulds.

I begin with what commonly firſt preſents it ſelf under the removed Turf, and which, for having never been violated by the Spade, or received any foreign mixture, we will call the *Virgin-Earth*; not that of the *Chymiſts*,  
but

but as we find it lying about a foot deep, more or less, in our Fields, before you come to any manifest alteration of colour or perfection. This surface-Mould is the best, and sweetest, being enriched with all that the Air, Dews, Showers, and Celestial Influences can contribute to it: For 'tis with good Earth, as with excellent Water, that's the best, which with least difficulty receives all external qualities; for the fatness of this Under-turf Mould, being drawn up by the kindly warmth of the Sun to its superficies, spends but little of its vigour in the Grass and tender verdure which it produces, and easily nourishes without dissipating its virtue, provided no rank Weeds, or predatitious Plants (consummating their Seeds) be suffered to grow and exhaust it; but maintains its natural force, and is therefore of all other uncultivated

cultivated Earths, the most grateful to the Husbandman.

Now as the rest of incumbent and subjacent Earths approach this in virtue, so are they to be valued; and of these there are several kinds, distinguishable by their several constitutions: The best of which is *black*, *fat*, yet porous, light, and sufficiently tenacious, without any mixture of Sand or Gravel, rising in pretty gross Clods at the first breaking up of the Plow; but with little labour and exposure falling to pieces, but not crumbling altogether into Dust, which is the defect of a more vicious sort. Of this excellent *black* Mould (fit almost for any thing without much manure) there are three kinds, which differ in hue and goodness.

The next layer in *series* to this, is usually mixt with a sprinkling of Stones, somewhat hard, yet friable,

friable, and when well aired and stirred, is not to be rejected; the looseness of it, admitting the refreshment of showers, renders it not improper for Trees and Plants which require more than ordinary Moistures. Declining from this in perfection, is the *darkish-Gray*, or *Tawny*, which, the deeper you mine, rises vein'd with yellow, and sometimes reddish, till it end in pale; and if you penetrate yet farther, commonly in Sand, and a gritty stone.

Of a second *Class*, is Mould of an obscure Colour also, more delicate grain, tender, cheffum and mellow; clear of stones and grittiness, with an eye of *Lome* and *Sand*, which renders it light enough, yet moist, of all other the most desirable for *Flowers* and the *Coronary Garden*.

To this we add, a yet more obscure, and sandy Mould, accompanied with a natural fatteness,

ness; and this, though rarer, is incomparable for almost any sort of Fruit-Trees.

A third participates of both the former, fattish, yet interspersed with small Flints and Pebbles; not to be altogether neglected.

A fourth is totally sandy, and that of divers colours, with sometimes a bottom of Gravel, now and then Rock, and not seldom Clay; and, as the foundations are, so is it more or less retentive of moisture, and tolerable for Culture: But all Sand does easily admit of Heat and Moisture, and yet for that not much the better; for either it dismisses and lets them pass too soon, and so contracts no ligature; or retains it too long; especially where the bottom is of Clay, by which it parches, or chills, producing nothing but Moss, and disposes to *Cancerous* infirmities: But

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if,



if, as somerimes it fortunes, that the Sand have a surface of more genial mould, and a *fund* of Gravel or loose stone; though it do not long maintain the virtue it receives from Heaven; yet it produces as forward springing, and is parent of sweet Grasse, which, though soon burnt up in dry weather, is as soon recover'd, with the first rain that falls.

Of pure and *sheere-Sand*, there's white, black, blewish, red, yellow, harsher, and milder, and some meer dust in appearance, none of them to be desired alone; but the grey-black, and ash-colour'd, and that which frequently is found in heathy Commons, or the travelling kind, volatile, and exceeding light, is the most insipid, and worst of all. I do not here speak of the Sea-Sands, which is of admirable virtue, and use in mixtures, and to be spread on some lands, because it has  
been



been describ'd so accurately already in a just discourse, upon another occasion, by an experienced Gentleman, dwelling in the Western parts, where this Manure is perfectly understood, and recommended to more general use.

As of Sands, so are there as different sorts of *Clays*, and of as different colours, whereof there is a kind so obstinate and ill-natured, as almost nothing will subdue it, and another so voracious and greedy, as nothing will satiate, without exceeding industry, because it ungratefully devours all that is applyed to it, turning it into as arrant Clay as it self: Some Clays are more pinguid than other; some more slippery; all of them tenacious of Water on the surface, where it stagnates and chills the plant, without penetrating, and in dry seasons costive, and hardening

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with

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with the Sun and Wind, most of them pernicious, and untractable.

The unctuous and fatter Clay frequently lyes upon the other, having oftentimes a basis of Chalk beneath it; but neither is this worth any thing, 'till it be loosened, and rendred more kind, so as to admit of the air and heavenly influences.

I had almost forgotten *Marsh-Earths*, which though of all other, seemingly, the most churlish, a little after 'tis first dug, and dried (when it soon grows hard, and chaps,) may with labour, and convenient exposure, be brought to an excellent temper; for being the product of rich Slime, and the sediment of Land-Waters, and Inundations, which are usually fat, as also the rotting of Sedge, yea, and frequently of prostrated Trees, formerly growing in or near them,  
and

and in process of time rotted (at least the spray of them) and now converted into mould, becomes very profitable Land: But whether I may reckon this among the natural Earths, I do not contend.

Of Loams, and Brick-Earths, we have several sorts, and some approaching to Clay; others nearer Marle, differing also in colour; and if it be not too rude, mingled, in just proportion, with other Mold, an excellent ingredient in all sorts of Earth, and so welcome to the Husbandman, and the Gardner especially, as nothing does well without a little dash of it.

Of *Marle* (of a cold sad nature) seldom have we such quantities in Layers, as we have of the forementioned Earths; but we commonly meet with it in places affected to it, and 'tis taken out of Pits, at several depths, and of divers colours, red, white,

grey, blue, all of them unctuous, of a slippery nature, and in goodness, as being pure and immixt, it sooner relents after a shower, and when dried again, slackens and crumbles into dust, without induration, and growing hard again.

Lastly, *Chalk*, which is likewise of several kinds and colours, hard, softer, fine, courser, slippery and marly, and apt to dissolve with the weather into no unprofitable Manure: Some of them have a Sandish, others a blacker and light surface; and there is a sort which produces sweet Grass, and Aromatick Plants, and some so rank, especially in the Vallies of very high Hills, as to feed not only Sheep, but other Cattel, to great advantage, as we may see in divers places among the *Downs of Sussex*. But it has a peculiar virtue above all this, to improve other Lands, as we shall come to shew.

I forbear to speak particularly of *Fullers-Earth*, *Tobacco-Clay*, and the several fictile *Clays*; because they are not so universal, and serviceable to the Plow and Spade; much less of *Terra Lemnia*, *Chia*, *Melita*, *Hetruria*, and the rest of the *Sigillate*; nor of the *Bolus's*, *Rubrics*, and *Okers*, *Figuline*, *Stiptic*, *Smegmatic*, &c. as they are diversly qualified for several uses, Medical, and Mechanical; but content my self with those I have already enumerated.

Now besides the Description and Characters we have given of these several Moulds and Earths, as they reside in their several Beds and Couches, there are divers other Indications, by which we may discover their qualities and perfections; as amongst other, a most infallible one is, its disposition to melt, and crumble into fine morsels, not turn to Mud

and Mortar, upon the descent of gentle showers, how hard soever it seem before, and if in stirring it rise rather in *granules*, than massy Clods.

If excavating a Pit, the Mould, you exhaust, more than fill it again, *Virgil* tells us 'tis good Augury; upon which *Laurembergius* affirms, that at *Wittemberg* in *Germany*, where the Mould lies so close, as it does not replenish the fols, out of which it has been dug, the Corn which is sown in that Country, soon degenerates into Rye; and what is still more remarkable, that the Rye sown in *Thuringia* (where the Earth is less compacted) reverts, after three Crops, to be Wheat again.

My Lord *Bacon* directs to the observation of the Rain-bow, where its extremity seems to rest, as pointing to a more roscid and fertile Mould; but this, I conceive,

ceive, may be very fallacious, it having two horns, or bases, which are ever opposite.

But the situation and declivity of the place is commonly a more certain mark; as what lyes under a Southern, or South-East rising-ground; But this is also eligible according to the purposes you would employ it for; some Plants affecting hotter, other colder exposures; some delight to dwell on the Hills, others in the Vallies, and closer Seats; and some again are indifferent to either; but generally speaking, most of them chuse the warm, and more benign; and the bottoms are universally fertile, being the recipients of what the showers bring down to them from the Hills and more elevated parts.

Another infallible indication is the nature, and floridness of the Plants which officiously it produces;



duces; as where *Thistles* spontaneously thrive; where the *Oak* grows tall and spreading; and as the Plant is of kind, so to prognostic for what Tillage, Layer, or other use the ground is proper; *Time*, *Straw-berries*, *Betony*, &c. direct to Wood; *Camomile*, to a Mould disposed for *Corn*, and I add, to Hortulan furniture; *Burnet*, to Pasture; *Mallows* to Roots, and the like, as my Lord *Verulam* and others observe.

On the contrary, some ground there is so cold, as naturally brings forth nothing but *Gorse*, and *Broom*, *Holly*, *Tew*, *Juniper*, *Ivy*, *Box*, &c. which may happily direct us to the planting of *Pine*, *Firs*, the *Phillyreas*, *Spanish Broom*, and other perennial verduries in such places.

*Moss*, *Rushes*, *Wild Tansy*, *Sedge*, *Flags*, *Ferne*, *Tarrow*, and where Plants appear wither'd or blasted, shrubby, and curl'd, (which  
are



are the effects of immoderate wet, heat, and cold interchangeably) are natural auguries of a cursed Soil. Thus as by the Plant we may conjecture of the Mould; so by the Mould may we guess at the Plant: The more herbaceous and tender, springing from the gentle Bed; the course and rougher Plants, from the rude and churlish: And as some Earths appear to be totally barren, and some though not altogether so unfruitful, yet wanting salacity to conceive, vigour to produce, and sensibly eluding all our pains; so there is other, which is perpetually pregnant, and this is likewise a good prognostic.

Upon these, and such like hints, in proposals of transplanting *Spices*, and other exotic rarities, from either *Indies*; the curious should be studious to procure of the natural Mould in which they grow (and this might be

be effected to good proportion, by the ballasting of Ships) either to plant, or nourish them in from the Seed, till they were of age, and had gained some stability of roots and stem, and become acquainted with the Genius of our *Climate*; or for Essays of Mixtures, to compose the like.

By the goodness, richness, hungeriness and tincture of the Water straining through grounds, and by the weight and sluggishness of it, compared with the lighter, conjecture also may be made, as in part we have shewed.

To conclude, there are almost none of our *Senses*, but may of right pretend to give their verdict here, and first,

By the *Odour* or *Smell*, containing (as my Lord *Verulam* affirms) the juice of Vegetables already as it were concocted and prepared; so as after long drowths,

drowths, upon the first rains, good and natural Mould will emit a most agreeable scent; and in some places (as *Alonso Barba*, a considerable *Spanish* Author testifies) approaching the most ravishing perfumes; as on the contrary, if the ground be disposed to any Mineral, or other ill quality, sending forth *Arsenical*, and very noxious steams; as we find from our Marshes and Fenny-grounds.

By the *Taste*, and that with good reason; all Earths abounding more or less in their peculiar Salts, as well as Plants; some sweet and more grateful; others bitter, mordacious, or astringent; some flat and insipid; all of them to be detected by percolation of untainted Water through them; though there be who affirm, that the best Earth, like the best Water, and Oyl, has neither Odour, nor Taste.

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By the *Touch*, if it be *tender*, fatty, deterfive, and slippery, or more asperous, gritty, porous and fryable; likewise, if it stick to the fingers like Bird-lime, or melt and dissolve on the tongue like Butter: Furthermore, good and excellent Earth should be of the same constitution, and not of contrary, as soft and hard; churlish and mild; moist and dry; not too unctuous nor too lean, but resolvable, and of a just and procreative temper, combining into a light, and easily crumbling Mould; yet consistent, and apt to be wrought and kneaded, such as having a *modicum* of Loam naturally rising with it, to entertain the moisture, does neither defile the Fingers, nor cleave much to the Spade, which easily enters it, and such as is usually found under the turf of Pasture-Grounds, upon which Cattel have been long ted and foddered. In a word,

word, that is the best Earth to all Senses, which is blackish, cuts like Butter, sticks not obstinately, but is short, light, breaking into small Clods, is sweet, will be temper'd without crusting or chapping in dry weather, or (as we say) becoming Mortar in wet.

Lastly, by the *Sight*, from all the Instances of Colour, and other visible Indications : For the common opinion is (though long since exploded by *Columella*) that all hot, and choleric grounds, are *red* or *brown* ; cold and dry, *blackish* ; cold and moist, *whitish* ; hot and moist, *ruddy* ; which yet, exhalations from Minerals, the heat of the Sun, and other accidents may cause ; but generally, they give preeminence to the darker Grays ; next, to the Russet ; the clear Tawny is found worse ; the light and dark-ash-colour (light also of weight, and resembling Ashes,) good for nothing ;

thing; but the yellowish-red worst of all. And all these are fit to be known, as contributing to noble and useful Experiments, upon due and accurate Comparisons, and enquiry from the several Particles of their Constitutions, Figures, and Modes, as far at least, as we can discover them by the best auxiliaries of *Microscopes*, *Lotions*, *Strainers*, *Calcinations*, *Triturations* and grindings, upon such discovery to judge of their qualities, and by essaying variety of mixtures, and imitating all sorts of Mould, foreign or *Indigen*, to compound Earths as near as may be resembling the natural, for any special or curious use, and be thereby enabled to alter the genius of Grounds as we see occasion.

The consideration of this it was, which gave me the curiosity to fall upon the examining of a Collection I had made of several

ral sorts both of Earth and Soils, such as I could find about this Territory ; whereof some I washed, to find by what would melt, reside, or pass away in the percolation, of what visible Figure they chiefly seemed to consist, armed as I was with an indifferent *Microscope*, of which be pleased to take this brief account.

*Gravelly* and *Arenous* Earths of several sorts, before they were washed, appeared to be, most of it, rough *Crystals*, of which some very transparent and gemmy ; few of them sharp or angular, but roundish ; mixed with Atoms and Particles of a mineral hue, which being well dried, and bruised on a hard serpentine Stone, and *Mullar* of the same, was with little labour reduced to an impalpable whitish Sand, untransparent, as it happens in the bruising of most, though never



so diaphanous bodies, which may be so reduced.

*Yellow Sand* had the appearance of Amber; bruised, an untransparent paler Sand.

*Fat rich Earth*, full of black spots, without much discolouring the water (as hardly did any of the Sands at all) being dried, was reduced to a delicate sandy Dust, with very little brightness.

*Marsh Earth* contained a considerable quantity of Sand, the rest resembled the Fat Earth.

The *Under-pasture mould* had likewise a sandy mixture, and what passed with the water after evaporation, seemed to be an impalpable, and very fine untransparent Sand.

*Clay* consisted of most exceeding smooth and round Sands of several opacous colours.

*Potters-Earth*, of different sorts, ground small, became like Sand,  
of



of a yellowish grey, and other colours, exceeding polite and smooth.

A certain *yellowish loamy Earth*, which had been brought to me, with some Orange-Trees out of *Italy*, was reduced to a bright soft Sand, appearing more gemmy than in the other Loams.

*Chalk* resembled fine white Flower, and some of it sparkling, especially the harther sort; but the tender, not.

*Fullers-Earth* appeared like *Gum tragacanth*, a little wetted, seemingly swelled, yet glistening; but when reduced to a fine dust, a smooth Sand.

*Tabacco-Earth*, not much bruised, was just like white Starch; washed, and well dried, it resembled the whitest Flower of Wheat a little candied: I had not the opportunity of examining the several sorts of Marles; and so I proceed to the *Dungs*.

*Neats-Dung* (the Cattel fed only with Fodder, or little Grass, for 'twas in the Winter I made my observations) appeared to be nothing but straws in the entire substance, and colour little altered, save what a certain slippery mucilage gave them, sprinkled with a glistring Sand, like Atoms of Gold; but upon washing and drying again, the tenacious matter vanished, and the straws appeared separated and clear.

*Sheeps-Dung* was much like the former, only the spires and blades of a fine short grass conglomerated and rolled up in the Pellets, and the glew about it less viscous, but it passed also away in the lotion.

*Swines-Dung* had the resemblance of dirty Bees Wax, mingled with straws and husks, which seemed like candied *Eringò*, and some like *Angelica* Roots.

*The Soil of Horses* appeared like

like great wisps of Hay, and little straws, thin of mucilage, and which being washed, was easily to be discerned by a naked Eye.

*Dears-Dung* much resembled that of Sheeps.

*Pigeons-Dung* consisted of a stiff glutinous matter, easily reducible to dust of a grey colour, with some husky Atoms, after dilution. Lastly,

The Dung of *Poultry*, was so full of Gravel, small stones, and sand, that there appeared little or no other substance, save a very small portion both of white and blackish viscous matter twisted up together; of all the other, the most foetid and ill smelling.

These were all I had time and leisure to examine, I cannot say with all the accurateness they were capable of, but sufficiently to encourage the more curious, and to satisfy my self, that the

very finest Earth, and best of Moulds, however to appearance mixt with divers imperfect Bodies, may, for ought we know, consist more of *sandy particles*, than of any other whatsoever; at least, if from this *Criterion* we may be allowed to pronounce, what they seem to the Eye, *Sands, Crystals, or Salts* (call them what you please;) the consideration of which being so universally the cause of *Vegetation*, was no small inducement to me, to see, if by examining the several Earths, (though but by a cursory inspection) I might possibly detect, what Rudiments of such a *Principle* there were lurking in them, abstractedly taken; not that I opine *Earth* to be *Salt* alone, and nothing else (though perhaps little more besides *Sulphur*,) for so it produces no Vegetable that I know of, without Water to dissolve and qualifie it  
for

for insumption, and perhaps some other matter fitted to receive the Seeds, and keep the Plant steady; which yet for ought I can discern, is also but a finer sort of Sand, the clamminess of it being rather something extrinsecal and accidental to it, than any thing natural, and originally constitutive: For, the combination of these several Moulds, which gives the ligature, slipperiness, and a divers temper, seems rather to be caused by the perpetual and successive rotting of the Grass, Plants, Leaves, Branches, Moss, and other excrescences growing upon it (than any peculiar or solitary principle apart) which in long tract of time, has amassed together a substance *heterogeneous* to the ruder Particles, which after the dilutions of the superficies (that is of the rich and fatter Mould) appears to be little other than *Sand*, or fixed *Salts*, of va-

rious Figures and Colours; since even the most obdurate and flinty Pebble, beaten and ground to powder, or by Calcination reduced to an impalpable dust, is as fine both to the Eye, and smooth to the touch, as the most *Smeetic* Earths and *Marles* themselves; such, at least, as you shall collect from the subsidence (to appearance) of the most Crystal Waters, precipitated by deliquated Oyle of *Tartar*, or the like; and the more they be subdued and broken, the harder they will prove, if (cleared of their *nitrous* parts) they pass the Potters Fire, however they seemed before to be of different constitution: This is evident in Vessels made of *Tabacco-Clay*, or whatever the material be, which has of late been so successfully employed, for the finding out of a composition (if so I may call it) nothing inferiour to the hardest

Pour-

*Pourcelain*, and almost as beautiful (by a worthy Member of this *Mr. Hook.* Society).

But to return to our superficial Earth, which we call the *Mould*, I affirm it to grow and increase yearly in depth from the Causes aforesaid; and in some places, to that proportion, as to have raised no inconsiderable Hills and Eminences, by the accidental fall and rotting of Woods and Trees; such as *Birch*, and *Beech*, &c. which are not of a constitution to remain long in the ground (as *Fir*, *Oak*, *Elme*, and some other Timber will do, and grow the harder) without corruption, and relenting into Mould as soft and tender as what they first were sown or planted in; and of this I am able to give undenyable Instances. I insist not here on the perpetual successions, and generations of *Flintr*, and other Stones, in the same places, where



where they have been sedulouſly gathered off, by many (not improbably) thought to proceed from *Worm-caſts*, hardened by the air, and a certain *lapideſcent ſuccus*, or ſpirit, which it meets with: And this, for happening moſt on Downs, very much expoſed (yet undiſturbed) is the more probable; as, on the other ſide, it eſtabliſhes our conjecture of the pureſt Moulds being capable of ſuch a change; that which is thus caſt up by the Worms, being ſo exceedingly elaborated and refined: Therefore let no man be over-confident, that becauſe ſome Earths are ſoft, fat, and ſlippery, they may not poſſibly conſiſt of Sands (of which there are ſo many kinds,) ſince 'tis evident, that even all foſſile Bodies, which can be reduced and brought to ſands, may by contrition of the Particles be rendred ſo minute, as to emulate

emulate the finest Earths we have enumerated; the compactedness, and accidental mixtures resulting (as we affirm) from things extrinsecal, not excluding exhalations, passage of liquors and several juices to them, or conveyed by subterraneous steams and influences; be the Stones or Rock *Glareous, Metallic, Testaceous, Salts*, or any other Concretes whatsoever. And what, if we should indeed suspect all Earth to be arrant *Salt*, nay *Glass*, and *that* Glass, how hard soever, the off-spring and child of water, the most fluid, crystalline, sincere and void of all other qualities? 'tis not impossible, I think, but by the different texture of its parts, even that liquid Element may be brought to the consistence of a most different body to what it appears: We know, that Water (besides that it was the first immense body which in-  
Gen. i.  
vested

vested the *Chaos*) was by some thought to be the Mother of Earth, (nay the *principia soluta* of all mixts whatsoever,) and that the bottom of the Sea was made by a perpetual *Hypostasis* or subsidence, which precipitated from every part of it to the Center. I do not stand to justify these speculations, but to illustrate what I am about; namely, that Water is apt enough to be condensed and made hard; and crude *Mercury*, and running metal, *Cryſtals*, *Gems*, and *Pearls*, do more resemble it, than that dirty and opaque body, which we usually denominate Earth: Besides we find, how divers Waters, not only indurate and petrify other substances, but grow into Stones, and leave a rocky *Callus* where they drop and continually pass, and that all sands and stones are not diaphanous; therefore that is no eviction, but that they might

might once have been fluid, since their opacity may be adventitious and proceed from sundry accidents; so as granting this *Hypothesis*, we are less to wonder, that this matter is above all other so disposed to Vegetation, and apt to produce Plants indued with Colour, Weight, Taste, Odour, and with sundry medical and other virtues, as I think that excellent Philosopher Mr. *Boyle* (an ornament of this *Society*) does somewhere make out from the various *Percolations*, *Concoctions*, and *Circulations* of that fruitful *Menstrue*: And if that be true, that there is but one *Catholic*, *homogeneous*, fluid matter, (diversified only by *shape*, *size*, *motion*, *repose*, and various *texture* of the minute *Particles* it consists of; and from which affections of matter, the divers qualities result of particular bodies;) what may not mixture,  
and

and an attent inspection into the anatomical parts of the vegetable family in time produce, for our composing of all sorts of Moulds and Soils almost imaginable, which is the drift of my present Discourse? And why might not *Solomon* by this means have really had all kinds of *Plants* in his incomparable Gardens? even *Ebony*, *Cloves*, *Cinnamon*, and from the *Cedar* to the *Shrub*, such as grew only in the remotest regions, furnished (as he doubtless was) with so extraordinary an insight into all natural things, and powers, for the composing of Earths, and assigning them their proper mixtures and ferments. I do not here enquire, whether there be not a *Pansperme* universally diffused, individuated, and specified in their several *Matrixes*, and receptacles *pro ratione mixti* (as they speak) but I think there might

might very unexpected *Phenomenas* be brought to light, in vegetable productions, did men seriously apply themselves to make such possible tryals, as is in the power of Art to effect; and how far *Soils* may be dissembled, and the *Air* and *Water* attempered, (at least for some curiosities, which may give light to more useful things) I do not conclude; but I should expect very rare and considerable things from an attentive and diligent Endeavour. To this end, the raising of artificial *Dews* and *Mists* impregnated with several qualities, for the more natural refreshment of Exotic Plants, were, it may be, no hard matter to effect, no more than were the modification of the Air abroad, as well as in our more confined Reserves, where we set them in for *Hyemation*, and during the most rigorous Colds. As for mixtures of *Earths*,  
Plants

Plants we know are nourished by things of like affinity with the constitution of the Soil which produces them; and therefore 'tis of singular importance, to be well read in the Alphabet of *Earths* and *Composts*: For, as we have said, Plants affect the *Marsh*, *Bog*, *Mountain*, *Vally*, *Sand*, *Gravel*, *fat* and *lean* Mould, according to their tempers; and for want of skill in this, the same Plant not only languishes and starves, but some we find to grow so luxuriate, as to change their very shapes, colours, leaves, roots, and other parts, and to grow almost out of knowledge of the skilfullest *Botanists*; not here to speak of what alterations do accrue from transplanting and irrigations alone. I mention this, to incite the curious to essay artificial Compositions in defect of the natural Soil; to make new confections of *Earths* and *Moulds* for



for the entertaining of the most generous and profitable Plants, as well as curious; especially if, as I hinted, we could skill to modify also the *Air* about them, and make the remedy as well *regional* as *topical*; and why not for other Fruits (Strangers yet amongst us) as for *Oranges, Lemons, Pomegranats, Figs*, and other precious Trees, which of late are become almost indemonstrable amongst us, and grow every generation more reconcilable to the Climate?

Here we might enlarge upon the several enquiries formerly suggested: As, how far *Principles* might be multiplied, and differenced by alteration and condensation? Whether Earth, stript of all *heterogeneity*, and uniform particles, retain only weight, and an insipid siccidity? And whether it produce or afford any thing more than embracement to the

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first rudiments of Plants, protection to the roots, and stability to the stem; unprolific, as they say, 'till married to something of a more masculine virtue which irradiates her; but otherways, nourishing only from what it attracts, without any active or material contribution: These indeed, with many other *queries*, do appositely come in here; but it would perhaps render this Discourse more prolix, than useful, to enter upon them in *detaill*; nor is it for me to undertake speculations of so abstruse a nature, without unpardonable ostentation; and therefore having only offered something towards the discovery of the great varieties, and choice of Earths, (such as we Gardiners and Rustics for the most part meet with in our Grounds,) my next endeavour shall be to shew, how we may improve the best, and prescribe  
remedy

remedy to the worst, by labour and stirring only, which being the least artificial, approaches the nearest to Nature.

At the first breaking up of your Ground therefore, let there be a pretty deep Trench or Furrow made throughout, of competent depth (as the manner is of experienced Gardiners,) the Turf being first pared off, and laid by it self, with the first Mould lying under it, and that of the next in succession, that so they may both participate of the Air, Showers, and Influences, to which they are exposed; and this is to be done in severals, as deep as you think fit, that is, so far, as you find the Earth well natur'd; or you may fling it up in several small mounds or lumps, suffering the Frosts and Snows of a Winter or two (according as the nature of it seems to require) pass upon them, beginning your

work about the commencement of *Autumn*, before the Mould becomes too ponderous and sluggish; though some there are, who chuse an earlier season, and to open their Ground when the *Sun* approaches, not when he retires: But certainly, to have the whole Winter before us, does best temper and prepare it for those impregnating agents.

In separating the surface-mould from the deeper, whether you make a Trench, or dig holes to plant your Trees in, be it for *Standards*, *Espalieres*, or *Shrubs*; the longer you expose it, and leave the receptacles open (were it for two whole Winters) it soon would recompense your expectation; and especially, if when you come to Plant, you dispose of the best and fattest Earth at the bottom; which if it be of sweet and ventilated *Mud* of *Ponds*, or *High-way-Dust*, were prefer-

preferable to all the artificial *Composts* you can devise: In defect of this, (where it cannot be had in quantity) cast in the upper *Turfs* (if not already consumed) the *sod* downwards, with the next adhering Mould for half a foot in thickness; on this a layer of well-matur'd *Dung*; then as much of the Earth which was last flung out, mixing them very well together: Repeat this process for *kinds, mixture, and thickness*, till your *trenches* and *holes* be filled four or five Inches above the level or *area* of the Ground, to which it will quickly subside upon the first refreshings, and a very gentle treading to establish the Tree. *Fruit* planted in such Mould you will find to prosper infinitely better, than where young Trees are clapt in at adventure in new-broken-up Earth, which is always cold and sluggish, and ill com-

plexion'd ; nor will they require (as else they do) to be supplied every foot with fresh Soil, before they be able to put forth lusty and spreading roots ; but which it is impossible to convey to them, so as to affect the underparts, by excavating the ground, and undermining the Trees (after once they arrive to any stature) without much trouble and inconvenience, and the manifest retarding of their progress.

If you will plant in *pits* and *holes*, and not give your ground an universal *Trenching* (which I prefer,) make them the larger (*five foot* at the least square) but not above half a *yard* or two *foot* deep, according to the nature of the Tree. In dressing the *Roots*, be as sparing as possible of the *Fibers*, small and tender strings (which are as the *Emulgent Veins* which insume and convey the nourishment to the whole

whole Tree;) and such of the stronger and more confirmed parts which you trim, cut sloping, so as the wound may best apply to the Earth. The *Head* or *Top* I advise you to let alone, 'till after the most penetrating colds be past, and then, about *February*, to take them off, and shape them as you please, and as the skilful *Gardners* can direct you. An *Orchard* thus planted, *Spring* and *Autumnal* stirrings of the Mould about them is of incredible advantage; and even during the hottest Summer-Months carefully to abate the *Weeds* (but not to dig above a quarter of a *Spit*-deep, for fear of exposing them to the *Sun*, unless it be after plentiful showers) is very necessary.

There are, I confess, who fantasie that this long exposure of Earth before it be employed for a Crop, causes it to exhale, and spend the



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virtue which it should retain; but, provided nothing be suffered to grow on it whilst it lyes thus rough and *fallow*, there's no danger of that; there being in truth no compost or latation whatsoever comparable to this continual motion, repastination, and turning of the Mould with the Spade; the pared-off Turf (which is the very fat and efflorescence of the Earth) and even Weeds with their vegetable *Salts*, so collected into heaps, and exposed, being reduced and falling into natural, sweet, and excellent Mould. I say, this is a marvellous advantage, and does in greater measure fertilize the ground alone, without any other additament: For the Earth, which was formerly dull and unactive, or perhaps producing but one kind of Plant, will by this culture dispose it self to bring forth variety, as it lies in depths, be it never so profound,

found, cold and crude, the nature of the Plant always following the genius of the Soil ; but indeed requiring time, according to the depth from whence you fetch it, to purge and prepare it self, and render it fit for conception, evaporating the malignant *halitus's* and impurities of the imprisoned air, laxing the parts, and giving easie deliverance to its off-spring.

I do not dispute, whether all Plants have their *primigenial* Seeds, and that nothing emerges spontaneously, and at adventure ; but, that these would rise freely, in all places, if impediments were removed (of which something has already been spoken;) & to shew, how pregnant most Earths would become, were these indispositions cured, and that those seminal rudiments, wherever latent, were free to move and exert their virtue, by taking off these Chains  
and

and Weights which fetter and depress them.

It is verily almost a miracle to see, how the same Land, without any other Manure or Culture, will bring forth, and even luxuriate; and that the bare raking and combing only of a bed of Earth, now one way, then another, as to the *regions* of Heaven and *polar* Aspects, may diversifie the annual production, which is a secret worthy to be considered: I am only to caution our labourer as to the present work, that he do not stir the ground in over-wet and slabby weather; that the *Sulcus* or Trench be made to run from *North* to *South*, and that, if there be occasion for opening of a fresh piece of Earth, for present use, he dig not above one Spit-deep, which will be sufficient to cover the roots of any plantable Fruit, or other Tree; otherwise, not to disturb

disturb it again 'till the *March* following; when, if he please, and that the ground seem to require an hastier maturation, there may be a Crop of *Beans*, *Pease*, or *Turneps* sown upon it, which will mellow it exceedingly, and destroy the noxious Weeds; after which, with a slight repastination, one may plant or sow any thing in it freely; especially *Roots*, which will thrive bravely; and so will *Trees*, provided you plant them not too deep, but endeavour to make them spread, and take in the succulent virtue of the upper Mould; and therefore too deep trenching is not always profitable, unless it be for *Esculent Roots*, such as *Carrots*, *Parsneps*, *Beets*, and the like; since *Trees*, especially *Fruit*, would be tempted even by baits, to run shallow; such as penetrate deep, commonly spending more in *Wood* and *Leaves*, than  
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in the burden for which we plant them.

There is only this caution due, that you never plant your *Roots* where the stiff and churlish ground is likely to be within reach of them; for though it be neither necessary nor convenient, they should penetrate deep, it is yet of high importance, they should dilate and spread, which they will never do in obstinate and inhospitable land (but revert back towards the milder and better natured Mould,) which crumples the roots, and perverts their posture to their exceeding damage. And to this infirmity our rare *Exotic Plants* and *Shrubs* are most obnoxious, confined as they are to their *Wooden Cases*, and *Testaceous Prisons*, and therefore require to be frequently trimm'd and supplied with fresh and succulent Mould to entertain the *Fibers*, which else you will find  
to

to *mat* in unexplicable intanglements, and adhere to the sides of the Vessel, where they dry or corrupt.

Having said thus much of the Natural, I should now come to Artificial helps, by application of Dungs, and Composts; and indeed, *stude ut magnum sterquilinum habeas*, was old and good advice; but for that there be, who affirm any Culture of the Earth preferable to Dung, even things so slight as the haume of *Peas* and *Lupines*, or any other *Pulse* (for when I speak of Dungs, I mean those excrementitious and sordid materials which we commonly heap up and lay upon our Grounds,) I beg your patience to suspend a while my stirring that less pleasant mixture, and, 'till it be well air'd and fit for use, proceed a little farther on our former subject, and try what aid we may yet expect from more  
kind

*Hesiod.*

kind and benign means, before we come to the gross and violent. For, besides that such compost (at least so prepared as it ought to be) is not every where; nor always to be had in quantities; to confide in Dungs and Ordure is not so safe and of that importance to our Husbandman, as some are made believe, since if we shall look back into the best experience of elder days, we shall find, they had very little or no use at all of *stercoration*. I know some there be, who attribute this neglect to the natural fertility of the Country, that 'tis the busie nurse of Vermine, and nauseous accidents; but waving these, (without intending to desert the aid of Soil in place and time,) I proceed with what I call more natural helps; namely, as we have shewed, by opening, stirring, and ventilating the Earth, and sometimes its contrary,



trary, by coverture, shade, rest, and forbearance for a season, as we daily see it practised in our worn-out and exhausted lay-fields, which enjoy their Sabbaths. 'Tis certain, that for our Gardens of Pleasure, the fairest beauties of the *Parterre*, require rather a fine, quick, friable, and well-wrought Mould, than a rank or richly dunged.

I shall here then begin with an experiment I have been taught by a learned Person of this illustrious Body, from whom I have long since received the choicest documents upon this and many curious subjects. And first, That amongst the mechanical aids, (wherein Stercoration has no hand) that of pulverizing the Earth by confusion, and breaking it with Plow or Spade, is of admirable effect to dispose it for the reception of all the natural impregnations we have been discoursing upon, as  
constant

constant and undeniable, I think will be evinced. For the Earth, especially if fresh, has a certain *magnetism* in it, by which it attracts the Salt, power, or virtue (call it either,) which gives it life, and is the Logic of all the labour and stir we keep about it, to sustain us; all dungs and other sordid temperings, being but the vicars succedaneous to this improvement, which of all other makes its return of Fruit, or whatsoever else it bears, without imparting any of those ill and pernicious qualities, which we sensibly discover from forced grounds; and that not only in the Plants which they produce, but in the very Animals which they feed and nourish.

I know, *Laurembergius* (somewhere) denies this, and that Animals in preparing *Chyle*, transmute, alter, and insume what is only their proper aliment; re-  
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jecting all that is superfluous ; but as our Early *Asparagus*, *Cauly-flowers*, and divers roots, manifestly refute it, so does the taste of the flesh, and milk of Cattel, and especially Fowle, that feed on the wild Garlick, Fenny-grass, and other rank and putrid things ; not here to insist on their sweet and delicate relish upon their change of Food, and more odouriferous pasture : But to the experiment.

Take of the most barren Earth you can find, drain'd, if you please, of all its *Nitrous Salts*, and masculine parts ; reduce it to a fine powder (which may be done even in large proportion, by a rude Engine, letting fall a kind of hammer or beetle at the motion of a wheel ;) let this pulveriz'd Earth, and for the time uncestantly agitated, be expos'd for a Summer and a Winter to the vicissitudes and changes of the seasons, and influences

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fluences of Heaven: By this labour, and rest from Vegetation, you will find it will have obtain'd such a generous and masculine pregnancy, within that period, as to make good your highest expectations: And to this belongs *Sr. Hugh Platts* Contrition, or Philosophical Grinding of Earth; which upon this exposure alone, without manure of Soile, after the like revolution of time, will, as he affirms, be able to receive an exotic Plant from the farthest *Indies*, and cause all Vegetables to prosper in the most exalted degree; and, to speak magnificently with that Industrious Man, to bear their fruit as kindly with us, as they do in their natural Climates: But a little to abate of this, modestly we may say, that this Culture (easy and simple as it is) will be found effectually able to render the Soil of a most extensive Capacity, for the entertainment

tainment of foreign and uncommon plants. For to enumerate some of its perfections; such as refuse Dung, and violent applications, have here pure Earth; and such as require aid, a mellow and rich mould, impregnated with all the blessings which the Influences of the Heaven, and efflorescence of the Earth can contribute to it; fitted, as it is, for Generation, and yet so restrain'd from it, as greedily to receive the first Seeds, which are committed to it, with a passion, and fervency as it were of animal love. What high and sublime things are spoken more upon this, I forbear to prosecute; but in Sir *Kenelme Digby's* discourse of *Sympathetic Powder* he affirms, that the Earth in the years of repose recovers its Vigor, by the attraction of the Vital Spirits, which it receives from the air, and those superiour irradiations, which en-

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dow simple Earth with qualities promoting fermentation. And indeed, such a vegetative activity I have often observ'd in the bare exposure of some Plants but for a few hours onely, as has rais'd my admiration, particularly in the *Aloe*, and other kinds of *Sedums*, which, when to all appearance shrunk and shrivel'd up, have fill'd themselves in a moment, set out in the Air, when a very few drops of water (at the same, that is, Winter, time) would certainly have made it rot, and turn to a mucilage, as, to my cost, I have experienc'd. And these Ferments of the Earth, by this amity and genial intercourse with the Air, are innumerable, to concoct, digest, accelerate, and restore; equal to, yea, beyond any artificial enforcements of Dungs, and compost whatsoever. But to return to dust again; by the toil we have mention'd,

mention'd, 'tis found, that Soil may be so strangely alter'd from its former nature, as to render the harsh and most uncivil Clay obsequious to the Husbandman, and to bring forth Roots, and Plants, which otherwise require the lightest and hollowest moulds.

In other cases and affections, the Earth may be likewise fertiliz'd as from without, so from within, by more recondite and central Causes, and agitations, which if in excess, may be allay'd with some feminine or other mixture; since often times, qualities too intense, rather poyson dry and cholerick grounds, than conduce to their advantage, as we shall come to shew; and that which makes a cold and moist ground fertile, will destroy the contrary, as we see it in too free applications of salt; and therefore it requires no ordinary dexterity, to be able to direct where,



and what remedies are to be administered; since we find it the same in Vegetable productions, as in the Animal, where Complexions should be suited; for want of which care, through avarice, and other sordid Circumstances, Noble Families themselves are many-times rendr'd Childless, which might else have multipli'd and been perpetuated. To illustrate this by our present subject: We find, that a thin seising, or sprinkling of Ashes, has enriched all the higher Pastures, when, where 'twas strew'd too thick, it became totally barren: sometimes again, defect of sufficient depth may be cause of sterility; and so it frequently happens, that the proper remedy of some hungry and shallow surface, is, to superinduce and lay more Earth upon it, and to find out the *medium* by diligent tryals of some degrees of depths in the same Soil; but solitary,  
single,

single, or over-hasty Experiments, before the Earth be prepar'd by some of our foremention'd Essays, may prove discouraging, and unsufficient, as my Lord Bacon has oft advertis'd us.

Earth is also sometimes improv'd by mixtures of Fearn, rotten leaves, and the pourriture of old Wood; the haulm of beans, pease, and other *legumina*, which heates, and accelerates Concoction; for which, and all other Medications, the nature of the Mould is carefully to be examin'd, that application be made accordingly; as for instance, If it be sandy, or other light mixed Earth, to imbody it with something of a fatter nature, as Lime, or Marle, (for I yet forbear the touch of ordure or animal Composts, as the least natural;) and be sure so to stirr, and lay it (especially if with Lime) that it may not sink too deep, and sud-

dainly, as 'tis apt to do, and so desert the surface-mould, where it should do the feat, and therefore it is to be the oftner renew'd. But Marle enters as properly here, and so does Mudd, Slub of slimy Waters; especially, if the soil be gravelly and mixt, which it will sadden and impinguate, and consequently combine; but if the Gravel be wet and cold, Lime is preferable: Wherefore the nature of the mould should be well examin'd before the application; as here *arenans* and sandy Earth wants ligature, and besides consisting of sharp and asperous angles, wounds and galls, curles and dwarfs our Plants, without extraordinary help, to render the passages more slippery, and easy; and therefore relenting Chalks, or *Chalk-Marle*, is also profitable, with Calcinations of Turfe, or *sea-Wrack*, where it is at hand; and if the Soil be exceeding

ceeding bibulous, spread a Layer or Couch of *Loame*, discreetly mingl'd, at the bottom, to entertain the moisture. In the mean time, there are yet some Plants which thrive almost in nothing so well as in *sand* alone, or with very little mixture, nor *that* of any Dung: So *Melons* are said to grow in *Jamaica*; and some vast Timber-trees have little or no mould adhering to their roots; such is that beautiful stranger, the *Japan-Lilly*, call'd by those of *Garnsey* (from whence we onely have them) *La belle de nuit*; and a certain *Palm* of the same *Japan*, which shrinks and dries at the least touch of Water, as if it were layd before the fire, which is, it seems, the onely remedy that restores it, or the suddain replanting it in *Scales* of *Iron*, or the most burning *sand*: But what if Sand it self, however vulgarly reputed, be not so hot, or inferiorly

teriorly ardent, as 'tis given out to be? Indeed, for being of an open and loose contexture, 'tis apt to put forth a forward spring, as more easily admitting the solar rays; but it does not continue, and is an infirmity which may be remedied with *Loam*, which not onely unites it closer for the present, but is capable in time to alter and change its very nature also, so as too hot a Compost be no ingredient with it.

Here I take notice, that Husbandmen observe, a too clean and accurate gathering of *Stones* from off those Grounds, which lie almost cover'd with them, rather impoverishes than improves it, especially where *Corn* is sown; by exposing it to Heat and Cold. Certain it is, that where they are not too gross, and plentiful, a moderate interspersion of the smaller Gravel preserves the Earth both warm, and loose, and from  
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too suddain exhalation; whilst the over-fine grain, or too nice a sifting, makes it apt to constipate, and grow stiff upon wetting; so as the tender Seedlings can hardly issue through; and this is a document for ignorant Gardiners, who, when they have a fine Flower, think they can never make the ground fine enough about them.

*Chalky* Grounds come next to be consider'd, and they should be treated like *Gravel*, *Sand*, and *Stony*, if harsh; but if of the melting kind, 'tis apt to mix with all the sorts of moulds, and being of it self so husbanded, composes a kind of natural Soil fit for most uses, sought for and of admirable effect in dry Grounds.

Here now of Course something we are to speak concerning *Calcinations*, all reducing of Stone into ashes being of excellent use, where *Lime* is upon any occasion proper;

proper ; and indeed all our Composts and Dungings serve but to this end, namely, so to qualifie, and mix the Soil, as may artificially answer to the varieties of the natural Earth, or such a Constitution of it, as the skilful Husbandman requires : As for Instance (since all fertility is the result of mixture contrary in quality) if it want due heat, to apply additions of a fiery nature ; and therefore 'twere profitable, if in the using *Lime* with *Turse*, and *Swarth*, it were laid alternatively, *Turse* on *Lime*, and *Lime* on *Turse*, in heaps for six months, by which means, it will become so mellow (and rich in nitrous Salts) as to dissolve, and run like Ashes, and carry a much more cherishing Vigour, than if amassed in greater quantity ; and so, by a too violent application, burn out, and exhaust the vegetative vertue which it should preserve. There



is (by the way) this caution to be us'd in burning of Earth, that tho what is torrifed into blackness, will exceedingly fructifie; yet, if it proceed to adustion beyond that degree, it consumes the Niter, which is the principle would be preserved; as we shall come to shew, when we speak of *Salts*, which we are the most carefully to keep intire, in all our animal or other Composts: If once the nitrous spirit be quite mortifi'd, the Earth produces nothing, till being long expos'd, it have attracted a fresh supply to give it life and prepare it for conception: For otherwise, all moderate burnings, yea, and even sometimes (to appearance) immoderate (as that of *Rose-trees*, *Reeds*, and some other, which makes them bear and come the better,) is excellent manure, as we see it in *Straw* and *Stubble*, enrich'd as they are with *Salts*; and if the  
very

very Earth be roasted with the fire, it solves obstructions, laxes the Pores, renders them attractive of the Influences, and to cherish with its warmth ; and the more simple and unmixt the Ashes be, in relation to what the Ground produces, it is the better: For as Weeds bring Weeds, so the Ashes of Fruits and Berries (being burnt) dispose to bring forth the same ; so as no treatment of the seminal rudiments whatsoever, seems totally of power to annihilate their virtue ; so strict is the Union of the parts, from whence their *Form* does result. The *Calcination* then of Earth alone, not onely disposes it to produce great variety, but, if it be intense, increases the very weight of the Mould ; whether from a certain magnetisme which it thereby contracts (which fortifies it to draw the proper aliment more powerfully) or upon what other account, let the curious examine.

I come next to *Marle*, of excellent use to fix light Sand and dry Grounds; some are for the White and Grey, others the Blew and Red (which I think the best,) according as 'tis more or less apt to resolve after wetting; but neither of them discovering their vertue for the first year: It does incomparably on Pastures; some on Arable, a good Coat of Compost, suitable to the land, being first spread, where you will lay it: If your *Marle* be very unctuous and rich, apply it less copiously; the too thick covering is the worst extream; nor is it alwayes to be us'd without allay and mixture with other proper Soil; for some *Marle* is more Sandy and gritty than other, and should be qualified with a Contrary: Give lean and emaciated Earth, a covering of the fattest *Marle*; hot and dry to the cold and moist: And this is also to be observ'd

observ'd in the applications of all other Composts and Medications.

Marsh, and Churlish Earth will be Civiliz'd, by the rigour and discipline of two Winters; *bis frigora*, is the old method to make the stubborn Clod relent; and with the mixture of a little Sand, if it be too close of Body, it will become excellent Mould.

*Clay* is of all other a curst Stepdame to almost all Vegetation, as having few or no *Meatus's* for the percolation of the alimantal showers, or expansion of the Roots; whether it be the Voracious, Hungry, Weeping or Cold sort: In these cases, *Laxatives* are to be prescrib'd, such as *Sand*, *saw-dust* with *Marle*, or *Chalk*, and continual vexing it with the Spade or Plow; but above all, with *Sea-sand*, where it may be procur'd, and the burning of the Ground to ashes, and  
all

all that it bears, the more the better; for by no less severity will this ill-natur'd Mould be subdu'd: Rotten wood, and the bottom of bavinestacks, is good ingredient to this manure; and if it be a cold and wet sort, strewings of foot is good; if very stiff, rubbish of brick, limestone, and such trash may properly be laid at the bottom, and on the upper part composts of dung; for otherwise no limings (which being fleckt is raw and cold) may at any hand be applied, especially the hungry sort, which (as also most kinds of Marsh-earth) is subject to *chasm*, and gape in dry seasons; to prevent which, a discreet mixture of *ashes* and *sand* is us'd, for if it be in excess, it over-heats the latter.

I do not reckon *Loames* among the *Clays*, though it seem to be but a succulent kind of *Argilla*, imparting a natural ligament to.

W. F. the

the Earth where you mix it, especially the more friable; and is therefore of all other the most excellent mean between extreams, fastening and uniting that which is too loose, cooling that which is hot, and gently entertaining the moisture. The Flower-Garden cannot be without a mixture of it, nor well any fruit, especially the best Cider Apples, so it be accompanied with a lighter soil.

To sum up all we have said concerning Natural Improvements by mixtures of Earth with Earth, rather than Dungs; let us hear my Lord Bacon. He reckons up *Marle*, *Chalk*, *Sea-sand*, mould upon mould, pond-earth with *Chalk*, and the several blendings and tempering of them; among all which, *Marle* we find to carry the preeminence with his Lordship, as the most pinguid, rich, and least over-heating; next to this, *Sand*, as the most abounding in  
salt;

salt ; *Chalk* more heating, and therefore proper for *Clay*; cold and spewing grounds, being suffer'd to lye a competent time to resolve before you turn it in ; earth on earth that is ( I suppose he means ) the under part upon the upper, or the second spit on the first, as we have all along directed at the breaking of fresh ground with the spade.

Another mixture he commends (and which we have likewise newly touched) of substances, which are not meer Earth, as *Soot*, *Asbes*, not the hard and dry *Cinders* of *Sea-coal* (which we are too busie with about this Town, where the ground is naturally too hot and dry) but such as is apt to relent, and even the sprinkling of Salt, where it is wisely sown.

A third is, the permitting Vegetables, abounding in *fixed salts*, to dye into the ground, as *Pease-*



*halm, Bracks*, all sorts of *stubble* cast on about the beginning of Winter : So *leaves* of Trees mingled with *Chalk*, and proper compost of dungs, to heat and preserve the ground from sowing with them, when they are us'd alone.

A fourth is (what we have also touch'd) heat and comfort, procur'd by *Calcinations*, the burning of *Ling, Heath, Sedge*; covering the ground with bushes for a time; enclosures of walls and mounds, when the land lies in the eye of the weather, and in other cases, *meridian* exposures, and the warmth of the woolly fleeces of sheep as well as manure, folded or pastur'd : And to this we may add the very grazing of Cattle, which in some cases has succeeded better than the best dungy compost, especially for old and decay'd Orchards, which have been observ'd to recover

cover to admiration, when mowing has been pernicious; for even the biting of Cattel gives a gentle loosening to the roots of the herbage, and makes it to grow fine and sweet, and their very breath and treading, as well as soil, and the comfort of their warm bodies is wholsom, and marvelously cherishing: But this is to be understood of places where the stems are of full growth, and where the beast cannot reach to crop, ~~and~~ <sup>and</sup> ~~not~~ <sup>not</sup> ~~giving~~ <sup>giving</sup> ~~it~~ <sup>it</sup> ~~and~~ <sup>and</sup>

Lastly, *Irrigation*, and watering, both by admitting and excluding moisture at pleasure: And certainly, this has (since his Lordships time) been found one of the richest improvements that ever was put in practice; especially, where they have the command of fat and impregnate waters, without grittiness, or being over-harsh and cold; whether it percolate through rich ground, or,

which is better, descending from eminences, and moderate declivities, from whence we find the Vallies so luxurious and flourishing.

To this belongs the cure of wet and boggy Lands, by cutting Trenches deeper than the cause of the evil, which proceeds from some conceal'd springs, hinder'd from emerging forth by the sluggish incumbent earth: This makes the ground to heave and swell, but not giving vent, to stagnate and corrupt both the water and the mould about it: And though it lie loose and hollow; yet it gathers no vigour from above, but remains cold and insipid. The remedy is, opening the ground till you meet with a sound bottom, and cutting your Furrow upwards to the Bog, about a foot beneath the spewing water: This is to be done in several places, and when the drains

appear

appear to have wrought the effect, you may fill them up again with sprag and bawne, great and rough flint, brick-bats, tile-shards, horse bones, or any other rubbish, which will remain loose and hollow, and cover them with the grassy side of the turff which you pared off, and laid apart; on ~~that~~ throw your other Mould, which being cast up in heaps for some time, will be much improv'd with spreading; lastly, sow it over with hay-seeds.

But the Cure is yet easier, if the Land lye considerably sloping; and if it happen to be a planted Ground, then cut your Trench deeper than the roots of your Trees, and apply the fore-said rubbish to intercept the moisture. About the latter end of *October*, trench the Ground all over, for near a foot and a half in depth, and when you are come within three or four foot of the

Stem, cut off all their larger roots sloping inwards, sparing only the fibers, and such of them as you find tender, and about as big as your finger; leaving also the more perpendicular to keep the Tree steady: This done, cast in some rubbish of *brick-bats*, *limestone* (not *chalk*) and other materials, that the Mould may lye easie about them, and with a mixture of good Earth, plenty of rotten stubble, or other soil, apply it near the Root, and fill your Trench with the rest; and if your Ground require it, (as being too cold it commonly does) add to your compost the Dung of *sheep*, *Pigeons* or *Poultry* very well consumed: And because *Moss* is oftner caused by starving and wet Grounds, than by hot and over dry (for both produce it) the Cure is likewise to be effected by *Ablaqueation* and baring the Roots, as above; and for the latter,

latter, by a mixture of *Loame*, with the scouring of Pond or ditch-Earth, which of it self is the most excellent manure; and the planting your Trees at greater intervals, for admission of *Air* and *Sun*; since the scraping of it off (which may also be done in wet weather) is but temporary, and if nothing else be perform'd, it will be sure to grow again.

Lands which are cold and dry, are (as we have hinted) to be improv'd by contraries; namely by application of composts, which are hot and moist; as *Sheep-dung*, burning and calcining of the Earth, with the Vegetables on it, and the like, to excite heat and fermentation; but which is not to be effected without repugnant remedies, and such as are of *heterogeneous* parts, to stir and lift up the Mould, and render it less unactive. If it be cold and clinging, as frequently 'tis found, there

## A Philosophical Discourse

there *lime*, *rubbish*, *sea-coal-ashes*, a moderate sprinkling of *sand*, with some proper compost may perform the Cure.

Hungry Grounds require to have the cause well look'd into; the water turn'd, (as above directed) or if it want, such as is well enrich'd.

Lands that are hot and burning, allay with *Swine-dung*, as (say some) the coldest; or with *Neats*, which will certainly refresh it.

For Earth which is too light, there's nothing better than *Pond-mudd*, after a winter has pass'd upon it.

Earth over-rank (for there may be some too fat, as well as too lean,) *sand* and *ashes* will take down; but still with regard to what you design to plant upon it; neither the *Almond*, nor the *Hassel* will indure a wanton Mould; and though it seem a Paradox, that



that any Soil should be too rich, (upon which some *Criticks* have suspected the Text in *Theophrastus*, which asserts it twice in two successive Chapters;) 'tis yet a Truth indubitable, and holds as well in Plants as Animals, which growing very fat, are seldom prolific. Some on the contrary are so emaciate, and lean, dry, and insipid, as hardly any pains will make them fruitfull. Such are *Minerals*, and *Metallic* Soils, devouring *clays*, light and *asfsands*; so again are putrid and fungous; others, though fruitfull, producing only venemous Plants, *Hemlock*, and the deadly *Aconitum*; and some, though wholesom ground, may be poison'd with unskillfull or malicious mixtures, and with damps and *Arsenical* vapours, which sometimes (though natural) are but accidental, and for a season, as when after extraordinary droughs,

Lib. 2/  
Cap. 5, 6.

drouths, and stagnant air, the Earth hath not been seasonably open'd, refresh'd and ventilated.

Moreover, Ground is sometimes barren, and becomes unfruitful by the vicinity of other Plants, sucking and distracting the juice of the Earth from one to another: For thus we see the *Reed* and *Fern* will not be made to dwell together; *Hemlock* and *Rue* are said to be inimicous; the *Almond* and the *Palm*, which are seldom fruitful but in Conjugation; and perhaps there are *Effluvia*, or certain inconspicuous steams of dusty seeds, which not only impregnate places wherenever grew any before, but issue likewise from one to another, as in our *Junipers* and *Cypress* I observe, flowering about *April*; which are Trees of Consort, and thrive not well alone. The *Ficus* never keeps her fruit so well, as when planted with the *Capri-*  
*fic.*

*fic.* By what irradiations the *Myrt* thrives so with the *Fig*; the *Vine* affects the *Elme* and *Olive* (which is at Antipathy with the *Oake*, and imparts also such a bitterness to the Mould, as kills *Lettuce*, and other subnascent Plants) is hard to say; and why some affect to live in crowds, others in solitude: But that *Firrs*, *Pines*, *Cedars*, *Elmes*, and divers other Trees aspire, and grow so tall in society, may be (as from other causes) so from their not overglutting themselves with nourishment (for *Compost* is not their delight) which inclines them rather to shoot upwards, than expand and spread.

Lastly, by *shade* Ground is render'd barren, and by the dripping of umbragious trees: To these Air and Sun may be soon restor'd, by removing of the skreens which intercept them; and yet all shade is not unpropitious, where the  
Soil

Soil and Climate are benign, as well as that which casts the umbrage; and of this we have a notable instance somewhere amongst the *Astomori* even in *Africa*, where the soil and the air are reported to be so genial, that the *Olive* is said to grow under the *Date-tree*, the *Fig* under the *Olive*, under the *Fig-tree* the *Granade*, under that the *Vine*, under the *Vine* a crop of *Corn*, and at the feet of the *Corn* a certain *pulse*; none of them impeded by the more than reduplicated shades. But there are some, we must confess, amongst us, which are not so propitious; Trees of all sorts (though the perennial Greens least) breath as much after the air as the soil, and do not thrive without it; nor except it be wholesom.

But to return to barren Earths, which are either out of heart, by being spent, or from the nature  
of

of the soil (in both which, the Plants which they produce, though never so unprosperous, run hastily to seed, or make an offer,) they are to be restored by the Plow, the Spade and the Rake, by stirring and repose, appositions and mixtures of Earth, *Calcinations* and *Composts*; and above all, by the eye of the Master, and dust of his feet, as the *Italian* Proverb has it. For after this Process, and innumerable other Tryals (mixtures of things being endless) all other sorts of Earths and imperfect Moulds may be treated and meliorated; namely, if it be too hard and close, to mollifie and relax it; if too loose, to give it ligature and binding; if too light, ballast; if too meagre, to fasten and impinguate it; if too rich and luxurious, emaciate and bring it down; if too moist, apply exsiccatives; if too cold, fermenting Composts; if

if excessive hot, to cool and refresh it; for thus (as we said) Earths should be married together like Male and Female, as if they had *sexes*; for being of so many several complexions, they should be well consider'd and match'd accordingly; and for this you see what choice I have presented you of *Sand, Ashes, Chalk, Lime, Marle*, mixture of *Mould, Calcinations, Air, Sun, Dew, Rain, Frosts and Snows, Trenching, Drilling, Watering, Infusions*, and finally, of *Animal Stercorations*, and other composts, which is the next, and last part of this (I fear) over-tedious Discourse: Since indeed it is not sufficient to find out even the best and most grateful Mould in nature, so as to relie for ever upon the same performance, without supplys of all sorts; stirring and repose, constant dressing, and (after all we have said) artificial  
*letations*

*latations*; likewise to encourage and maintain it in vigour.

We proceed then in the next place to what farther advancement we may expect from *Stercoration*, and manuring the ground by *Composts*, and to discover the qualities, which may be latent in their several ferments, and how to apply them by a skilfull and philosophical hand, without which they do alwayes more hurt than good; and therefore first we will enumerate their several kinds, and next inquire, what it is we chiefly seek for, and expect from them; and lastly, how to treat them so as may render them fitting for our service.

From *Animals* we have the Soil of *Horses*, and beasts of burden, *Neats*, *Sheep*, *Goats*, *Hogs*, *Pigeons*, *Poultry*, and *Fenny-fowle*: We have also *Flesh*, *Fat*, *Blood*, *Hair*, *Feathers*, *Urine*, *Shavings of Horn*, *Hoofs*, *Leather*, *Skins*,  
G Fish,



*Fish, Garbage, Snail-mud, &c. From Vegetables, (as of nearest affinity) we have Vine-cuttings, Stalks, fall'n Leaves, Marc of the Wine and Cider-presses, Lees of Wine, Oyl, rotten Fruit, Gourds, Weeds, Fern, Haulme, Stubble, rotten Wood, Saw-dust; refuse of the Tan-pit, Sea-wood, Linnen Clowts and Old Rags; also Brine, Pickle, Ashes, Soot; and of things promiscuous, Washing of Dishes, Bucks, Barrels, Soap-suds, Slime, and Scouring of Ponds, and High-ways, Dust, Sweepings: In summ, whatsoever is apt to rot and consume in any competent time, and is either salt, unctuous or fatty: To which let me add, impregnating Rains and Dews, cold and dry Winters, with store of Snow, which I reckon equal to the richest Manures, impregnated as they are with Celestial Nitre. But with all these Auxiliaries, we are not yet to imagine, that any*  
of

of them are therefore profitable and good, because they retain an heady scent; are hot, moist, rotten and slippery, fat or unctuous, and the like, which are all qualities, that *alone*, and of themselves, effect little, till they are corrected and prepar'd; but, for that amongst these materials we detect the causes of fertility more eminently than in other substances; partly from their *fixed salts*, or some virtue contain'd in them, or rather drawn from without, and imparted to the exhausted and defective Earth; and that by such a process, as by converting them into a *Chyle* (as it were) it facilitates their being insum'd, assimilated, and made apt to pass into nourishment, promoting vegetation. This obtain'd, the next thing is, how skilfully to apply what we have prepar'd; and this indeed is a difficulty worthy the heads as well as hands of the pro-

foundest Philosopher ; since it requires a more than superficial knowledge and penetration into causes.

We know indeed, that the Earth is without any Artificial Auxiliaries, indu'd with a wonderful prolific virtue ; but this, for being possible to be lost and decay, (at least for a longer time than our necessities can support) and from some grounds never to be expected without such helps, it may be worth our while a little to consider, by what expedients of digestion, or other wayes, the desir'd effect of perpetuating its vigour might best be accomplish'd.

That the secret we enquire after, and which does most apparently seem to evirtuate towards this end, is some *Salt*, I suppose is generally agreed : For *Salt* it is which gives ligature, weight, and constitution to things, and is  
the

the most manifest substance in all Artificial Composts.

'Tis the *Salts*, which intice Roots to affect the upper and saline surface of the Earth, upon which the *Nitrous* Rains and Dews descend, and the cause that some Plants, the most racy, and charg'd with juice of all other, (for such is the *Vine*) thrive so well amongst Rocks and Pumices, and in whatever best maintains this vital pickle.

'Tis *Salt*, which makes all cover'd and long shaded Earths to abound in fertility, and renders the dung of *Pigeons*, *Poultry*, and other *Salacious* Corn-fed Birds, so eminently effectual, before the soil of *Horses* and other Beasts, in which it less abounds, as having less virtue to attract it.

'Tis *Salt*, that gives such vigour to places, sprinkl'd with *Urine*, *Soot*, *Ashes*, &c. which have them not diluted; and to

*Bones, Flesh, Horn, Hair, Feathers, Blood*, and the rest of those animal excrements : And whence those seminal Masses should proceed after *Calcination* of the Earth, when it comes to be expos'd again, is hard to divine ; whence I say, they should derive their life and energy, without being destroy'd by so powerful an agent as Fire, unless they lurk in some vegetant and indissoluble salts, (volatile, fixed, or nitrous Earth) from whence they *Phœnix*-like emerge ; though I do not say without any other specific rudiment : But 'tis strange, what, as I remember Dr. *Morison* affirms of the *Erysimum* or *Iris*, so seldom seen to grow spontaneously in *England* before the late prodigious Conflagration of this City, when there appear'd more of it amongst the Ruines, than was known to grow in all *Europe* besides, it being a curious *Exotic*,

to be found most about *Naples* in the time of *Fabius Colonna*, and but rarely elsewhere.

'Tis *Salt* which resuscitates the dead and mortifi'd Earth, when languishing and spent by our indulgence to her verdant Offspring, her vigour seems to be quite exhausted, as appears by the rains and showers which gently melt into her bosom: what we apply to it, and for which cause all our Composts are so studiously made of substances which most ingender or attract it.

'Tis *Salt*, which fertilizes, and renders *Egypt* so luxuriously fruitful after the inundations of *Nile*; and the *Nitrous* grounds of *Jamaica*, and other places, which cause so stupendious a growth of Plants and Trees.

'Tis the want of *Salt*, which emasculates the virtue of Seeds too long macerated in hungry water, and renders floated wood

such unprofitable fuel, and to turn into such insipid ashes; and whatsoever it be some Plants may appear to affect, as to the external differences of appetite, some of them seeming to draw in more Air, some Earth, and others Water in extraordinary measure, according to the several contextures of their parts, or by whatever *Magnetisms* and attractives, it is still to come at their *Salts*, which doubtless create that inclination, compose the various saps and juices which they present us. Nay, what if I should say, that all the several parts of Vegetables were endow'd with their peculiar and distinct *Salts*, through different motions, complications and percolations? or, that so many *Earths*, so many kinds of *Salts* digested and transported by their different *Vehicles* and strainers; and those also, though unlike in quality, yet perfectly



fectly congruous to what they produce and nourish? But what this *Vehicle* or *Menstrue* is, I contend not; 'tis evident, that *Salts* unite best with water, Vernal and Autumnal Showers and Dews, as the most apt to convey their insinuations. You know, who have dignified *salt* with the prerogative of being nam'd *Element-earth*, the *vigour* and *close* of all things, yea, the first and last of *Elementated* bodies: What shall I say, *quid Divinum*, the Original of all fecundity; nor can I say less, since there was nor sacrifice, nor discourse acceptable without it. And verily upon serious contemplation of the premises, and the little experience I have had of their effects, in this work of vegetation, as far as I am able to penetrate into causes by them, I am not displeas'd at the magnificent *Epithets* which are given it. In the mean time, I know there  
be,

be, who are so averse to this Doctrine, as to prefer *Water* before it, nor contend I with them, so they allow the near affinity and friendship which is between them, as I have deduc'd it at the entry of this Discourse, where I describe my *Autoptical* observations of the several *Earths*; all that I pretend from hence, being only to excite us to make diligent enquiry, what may more likely be the cause of Vegetation, and whether *Salt* have not a Dominion almost *Monarchical* in this great Work of Nature, being so absolute an ingredient in all our Dungs and Composts, which I am next going to speak of. I cannot in the mean time but wonder, how a thing so eminently sacred, and fertile, should come to be the *Symbol* of Malediction, when, as the custom was, they us'd to sow *Salt* on *Cities* they had curs'd, there being in all Nature

ture nothing so pregnant and fruitful, unless it were to invite the Plow to go there, and that the fertility of the spot for Corn and Grain might divert them from rebuilding and covering it again with houses. Indeed to apply *Salt* in excess, burns the Earth for a time, so as nothing will grow upon it; but when once the rains have well diluted it, it springs up more wantonly than ever: This I daily find by sifting common *Salt* upon the gravel-walks of my Garden, and for which cause I have left it off; and we find that the Earth it self over-marl'd and too highly manur'd is as unprofitable, as if it were barren for the time, and that there is in all things a just proportion to be observed.

But neither all this while do I pretend, much less determine, that the Principle I so much celebrate, is our common artificial  
*Salt,*

*salt*, compos'd of Urine, and the like, which of it self is so burning and destructive, till its acidity be qualified by the air and showers from heaven (which endows it with a natural magnetism, to receive their irradiant virtues;) but a certain more unctuous spirit, or airy *Nitre*, pregnant with a vital Balm, which is the thing we endeavour to find in these materials of Composts: But whether it be accidental, or essential, corporeal, or more spiritual, principal, or organical; or (to speak with the *Chymists*, and later *Atomists*,) whether communicated by *effluvias*, *salts embryonate*, or *indigested* and not *specificate*; from *ferments*, *spermatic vapours*, *influences Celestial*, or from liquor only impregnated and concocted, I leave to those who affect to wrap up easie notions in hard and uncertain terms, whilst the thing would be of use to the Philosophical

losophical *Husband-man*, were their reduction into just *Classes*, for the better discriminating of the several Composts; as what there's of them most abounds in *Nitrous* or *Urinous* parts; or what of the nature of our crude, common *Salts*, and *Kali's*, *Mineral*, or other; and thereby be able to pronounce, where, and how we may apply them with safety and success: For some we know are plainly exitial and deadly to plants (such as the *Mineral*,) others properate too fast; and some are sluggish, and scarce advance them at all. It would therefore be consider'd, whether any *Salts* do universally nourish all Plants alike? or rather partly, some *one* Plant, some *another*; for upon the clear decision of this secret depends all that is truly curious in this affair; laying, as I do, for position, that the improvement of all the Earths and  
Soils

Soils I have spoken of, results from some *Salt* or *Spirit* (call it which you please) as from an indispensable *Principle* in this of *Vegetation*, and perhaps the first rudiment of life in all things else: And till we shall arrive to this (by what I have observ'd in the discreet use even of our common *Salt*, brine, the effects of *Urine* and the like,) I firmly believe, that, were *Salt-Peter* (I mean fictitious *Nitre*) to be obtain'd in Plenty, we should need but little other Composts to meliorate our Ground; since, whether that which so fertilizes it, by any mixture we can yet devise, effect it from any other cause, is greatly to be doubted; nor do I think, but the charge of extracting it, (at least sufficient to impregnate Water in convenient quantity) might be compass'd by the industrious Farmer without much inconvenience, or the least difficulty,

ty, were he competently instructed in the process of *Calcination*, *Resolution*, *Percolation*, *Evaporation* and *Separation*, put into honest *English*, and easily to be learn'd : Soon we should then see, that this were not to be extracted altogether out of stinking dung, and found in heady trash (which yet is material) but rather in the well-impregnated and natural Mould it self, charg'd with a more generous spirit, or medicinal *Nitre* (in congress with a certain *sulphur*) capable to warm, and excite to vegetation, beyond all we can promise from any meer artificial ferments, much less our common mixtures, and wayes of *stercoration*, which in time grow cold and languish, and are so quickly check't.

And now after all this, I dare not say, that there is nothing more than this meer *Salt*, or spirituous *Nitre*, which concurs to those



those desir'd effects, that promote fertility, and set the ferment on working : What *ignite particles* beside, and special Composts there may be of consanguinity and near alliance to the respective vegetables (which we know to be of vast difference one from another,) we pretend not to determine; for some Plants are very brisk and quick, others insulse and flat; some are acid, others more dulcorous and sweet; they are salt, sowre, luscious, austere, hot, bitter, moist, dry, astringent, and of strangely different qualities, not to speak of their effects, which it were hard to number. Therefore, that the same Compost, or remedy should be promiscuously universal, is the more unlikely, and would be well consider'd : But admitting this to be salvable, and that we find by experience, a well digested Compost beneficial to almost all the vegetable

vegetable Family; may it not in all probability spring from its participation of all those varieties of ferments, (in some at least, though in different proportion) which we have been speaking of? as by which each single *species* draws and assimilates that only to it self, which it finds most amicus and congruous to its nature; and if so it be, then have we no more to do, than to learn how to prepare our *Ferments*, and apply them accordingly; namely, acid to acids, sweet to sweets, benign to benign, and so the contrary, as we would promote its natural quality; and this perhaps, either by reducing some parts of them into Composts, as their leaves, stalks, fruit; or by some more refin'd extraction of their Salts, convey'd in proper vehicles. And for the better administring of this, the nicer textures of vegetables should diligently be consider'd;

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their

their several vessels, and *Organic* parts, since every impregnate liquor is not presently fit for all alike; the figuration of their *Labiola*, and curious pores (which 'tis likely draw several juices and spirits) being very different; as the most sagacious Doctor *Grew*, and learn'd *Malpighius* (both Ornaments of this Illustrious Society) have begun, (I think I may say) well nigh perfected the way to us, in those elaborate *Anatomizations*, which the world will shortly admire. I insist the rather on this, because we find some Plants to reject divers rich compounded liquors, especially such as pretend to work Miracles in the *Protean* changes of colours, and other qualities, from *mineral* or other substances; and that the very Rains and Dews differ in several *Climes*: So as even from this reason alone, to instance in no more, all Plants do not easily become

become denizons in all places :

— *Nec omnis fert omnia tellus.*

I might add to this the niceness of their palates, and fondness to their own homes, and to live some in consort, some in solitude, some on dry banks, some in watry puddles, and some as it were in the very air, and fiery soils; nay, some which are found to destroy the vegetable virtue where they grow; for such are said to be *Oade, Hemp, &c.* and if it be true and constant, that all our imbibitions of Salts and Composts signifie little to Earth pre-impregnated with a salt or virtue, different from what the Plant does naturally delight in, some obscure footsteps of which every Plowman seems to discover, which makes him change the Crop in some places yearly: For the first, second, or third burden of the

same grain, especially *Wheat*, will exhaust that which is its proper aliment, and then leave the rest to more ignoble grain, which will be found to thrive well enough, till at last several successions of different Seeds quite wear it out, and then it must repose, or be manur'd with Composts for fresh life and vigour. And to this we may add, how some Plants again require little change, or help of Art; such as most of the *Perennial Greens*, and amongst these, the most *resinous* and oylie, as the *Pine, Firr, Cedar, &c.* which thrive on barren Hills, and grow in Rocky Crannies, without any Earth almost to cover and protect their Roots. Of this sort I have a *Cedar-Table*, which was saw'd out of a Spur only of a monstrous Tree growing in the *Barbadoes*, which held six foot long, five foot broad, and three inches thick, form'd and wrought

as it stands upon the frame; and his *Royal Highness*; had another of a much larger dimension, namely eighteen foot in length, and nine in breadth, cut out of the Stem, which was of prodigious growth, to be fed and nourish'd as it was between the barren Rocks. But to proceed; we find that most *esculent* and *culinary* Roots do rather chuse a rich, natural and light Mould, inclining to sand, than what is forc'd, or over-muck't; and how much they yield to soil, growing hard, short and fibrous, and contract the smell and relish of the ferments, apply'd to accelerate their growth (for according to the *Italian Proverb*, *Ogni pianta serba della sua radice*, Every Plant has a smack of the Root) I have already mention'd; so as to confide in Dungs, as our vulgar Gardners about this City do, is no encouragement; and there-

fore some, not without good reason, prefer the Corn and Grain which is reap'd from *Marle, Chalk, Lime*, and other more natural Manure, before what is produc'd from a Crop which grows on a Dung-hill in comparison; experience also shewing, that the cause of smuttiness many times proceeds from the impurity, and rankness of the dressing; and therefore we omit to enumerate amongst our Soils, *Stercus humanum*, which howsoever preferr'd by some before all other, and mention'd by *Columella* with that of Fowl and Cattel, does, unless exceedingly ventilated and air'd, perniciously contaminate the odor of *Flowers*, and is so evident in the Vine, as nothing can reconcile it.

To give some instances of the nature of particular and simple *Composts*, (for so I take leave to use a *Solecism*, till they are blended together with the rest, as we shall



shall afterwards shew) what ever they be, they are by no means fit for the Earth, and use of the Husband-man, unless, besides their richness, they be perfectly well digested, made short, sweet, and almost reduc'd to a crumbling Mould; so order'd, as not only not to lose any of their virtue, but improve it, and to excite, entertain, and communicate heat, and vegetative Spirits to what you shall apply them: And that this is not done *per se*, that is, by immediate application, without prejudice (unless it be for the *Hot-Bed*, which yet has an *Intermedium* of Mould) experience tells us, especially in the soil of *Animals*, which is of all other the most active, as consisting of *Heterogeneous* parts, and repugnancies, without which no fermentation could be obtain'd. Now since many of these being freshly made, are not only sensibly hot,

but mordacious and burning, they are with caution to be us'd. That every kind of Earth (as well as the Dung of Beasts, &c.) has its peculiar *ferment*, and operates accordingly, either by attracting something to it, or embasing what approaches it, sufficient has been said; together with directions how to mingle and attemper it, as best may qualifie it for Culture. That we may do the like with the several sorts of *Soil*, let us consider what their natures are, what their correctives, and how to apply them.

*Horse-dung*, the least pinguid and fat of any, taken as it falls, being the most fiery, excites to sudden fermentation above any; wherefore, as we said, 'tis then fit only for the *Hot-Bed*, and when that fervour's past, may be spread on fields, where we would have a rank Grass to spring; but is at no hand to be admitted into the Garden,

Garden, or where you desire good *Roots* should grow, unless the ground be very cold or wet, and then too it had need be well rotted, lest, instead of curing it, it leave *couch*, and pernicious weeds, worse than the Disease; the seeds of Hay, and other Plants, of which the *Horses* eat, coming oftentimes intire from them: And such vegetables do commonly spring up from the Soil of Cattel, of which they chiefly eat; as long *knot-grass* from this Beast; short, clean and sweet pasture from *Sheep* and *Cows*; the *Sonchus*, or Sow-thistle from the *Swine*: So as ground muck'd with *Horse-dung* is alwayes the most infected of any, and if it be not perfectly consum'd, it makes your *Roots* grow forked, fills them with worms, and imparts to them an unpleasing relish; but being laid on at the beginning of winter, and turn'd-in at spring, it succeeds sometimes with *Pulse*. The

The Soil of *Asses* is highly esteemed, for its being better digested by the long mastication and chewing of that dull Animal; but since we have no quantity of it in this Country, it does the less concern us.

*Neats Dung*, of all other is universally the most harmless, and the most useful; excellent to mingle with *sandy* and hot grounds, lean or dry, and being apply'd before winter, renders it the most like natural Earth, and is therefore for the Garden and Orchard preferr'd to any other. To use it therefore with the most certain success in such thirsty Grounds, apply a plentiful surface of it, so blended, as the rain and showers may wash in the virtue of it thoroughly; but this is best done by making the Dung the finer, and then working it in at a soaking wet (not stormy) season, and then leaving it also cover'd with it

it for some time, if the rain descend in too great excess.

The next is *Sheeps Dung*, which is of a middle temper between that and *Pigeons*; profitable in cold Grounds, and to impregnate liquors, of choise use in the Garden.

The Dung of *Swine* is esteem'd the coldest and least acrimonious (though some there be who contradict it) and therefore to be apply'd, to burning Lands; but alwayes so early interr'd, as never to appear above ground, where it is apt to produce weeds in abundance, from the greedy devouring of what it eats. This, though not so proper for the Garden, is said yet to *edulcorate* and sweeten fruit so sensibly, as to convert the bitterest *Almond* into sweet, and therefore recommended, above all others, for experiments of *change* and *alteration*: Some qualifie it with bran,  
or

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or chaff well consum'd, greatly comfortable to Fruit-Trees, but especially the hairs and bristles, buried about the Roots of Pear-Trees.

*Pigeons Dung*, and that of *Poultry* (especially of *Aquatic Fowls* which is too fiery) full of volatile salts, is hot and burning, and therefore most applicable to the coldest ground. There is nothing so effectual to revive the weak and languishing Roots of Fruit-trees, laid early to them; but first be sure they pass their mordicant and piercing spirits, and be discreetly mixt.

Very efficacious is this Dung, to keep frost out of the Earth, and therefore of great use to cover the Mould in *Cases* of *Exotic* and tender Plants; but if the heat be not well qualified, the very steam will kill them in a moment; therefore let a full winter pass over this *letation* for most uses.

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The best way of preparing it, is to reduce it into powder, and mingle it with the Mould, and to water with its infusion, which alone does wonders; or, if it have been well expos'd and abated, you may use it at the spring without addition: But if you desire something that is exquisite, macerate it well rotted in the *Lees of Wine*, stale *Urine*, and a little *Brimstone* beaten very fine, to mingle with your Earth, for one of the richest Composts. Then is this only to be noted, that, as the effect of this Dung is suddain, so it lasts not long, and therefore must be the oftner renewed.

The flesh of *Carrion*, and dead Animals, being (as, I think, my Lord *Bacon* tell us) prepar'd already by so many curious Elaborations of its juices, is highly effectual; but it should be very well consum'd, and ventilated, till it have quite lost its intolerable



rable smell, and therefore never apply'd too crude.

*Blood* is excellent almost with any Soil where Fruit is planted, especially the Mural, to improve the blood of the *Grape* of great advantage, being somewhat diluted, and pour'd about the Roots.

*Urine*, for being highly spiritous and sharp, had need be well corrected, and then, being mingl'd with other Composts to allay its acrimonious salt, it hardly has its equal.

*Hair*, *Horn-shavings*, *Bones*, *Skins*, *Leather*, &c. are deeply to be buried, and so as not to touch but lie about the Roots: These, with *Rags*, coarse *Wooll* and *Pitch-Marks*, improve the Earth, as being full of volatile salts: And *Fish* is likewise spread to great advantage of Grounds, where 'tis to be had in plenty; and for being quickly consum'd,  
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may soonest be apply'd. We come to Vegetables.

The *Marc* and pressings of the *Grape* are good Compost, and so is the *Lees* of Wine, mingled with the Mould: It is of singular comfort to the Roots of *Orange-trees*, and *Case-Plants*; and if you sift a little brick-dust with it, and bury it near the Roots of *Rose-Mary*, it will thrive wonderfully. It may be a laudable Compost for moist grounds, where that Plant so unwillingly grows.

The *Leaves* of Trees are profitable for their own Fruit, and natural, being well rotted, and not musty: The *Peach-leaf*, hurtfull to Cattel, is excellent for the Tree from which it falls; and the *Walnut-leaf*, noxious to the grass, is helpfull to the Tree.

*Saw-dust*, *Rotten wood*, found in the hollow of decay'd Trees, under the stacks, and where Trees grow thick together, as in great  
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and old Woods, but especially, that which is taken out of an inveterate *Willow-Tree*, is preferable to any other for the raising of *Seedlings* of choice Plants, mix'd as it should be with a little *Loam*, *Lime-rubbish* and *Mould*, as we have taught. This, and the rest should be well ventilated, and is of great effect to loosen and mellow ground.

*Wood-ashes*, rich and impregnate with salts, are fit for wet Ground without mixture, and in pasture, excellent, not sifted-on over thick : It likewise kills the Worm; but in Earth which is subject to over-heat and chap much, *Ashes* and burning Composts do but increase the scavor, and therefore contrary remedies are to be sought ; such as *Neats* and *Swines Dung*, but not so when Lands are naturally or accidentally cold : Wherefore we should endeavour by all means  
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to detect, as far as we are able, the quality predominant both of the Earth we would improve, and the Composts we apply, and not throw them on promiscuously upon every thing without considering of what temper and constitution they be; for Grounds are as nice as our Bodies, and as obnoxious to infirmities upon every defect and excess; and therefore it requires skill, and no little study to be able rightly to marshal this *Materia Medica* (as I may call it) of Composts, the virtue of which does sometimes lie very hidden; at least, if that be true which Sir *Hugh Plat* affirms, that what we all this while seek after, is indeed altogether invisible to humane eyes, and to be discern'd only by the eyes intellectual, because 'tis vail'd and clad under so many different bodies, whereof some are more ponderous, such as *Marle, Chalk, the Dung of*  
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*Beasts*, &c. some more light, as their *Flesh*, *Bones*, *Hair*, &c. and some yet lighter, as *Grain*, and generous *Seeds*; for in such as have *Virtue* to multiply their own *Species*, that Spirit is invested with a very thin and curious integument, as in effect is apparent in the *Blood* and *Flesh* of *Animals*, so much more powerful for the enriching of Land than their *Dung* and *Excrements*; this industrious man computing it to no less than twenty times, and to the same advance above this, *Hair*, *Wooll*, and *calcin'd Bones*, &c. and as to the courser Soils, that the *Dung* of *Pigeons* and *Poultry* does as far exceed that of *Beasts* which feed on gross *Vegetables*; and tells us, it has been found upon experience, that one load of any sort of *Seed* contains as much *Virtue* as ten load of ordinary *Dung*; and therefore 'tis advisable, that upon all removals  
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of *Corn-ricks*, *Hay-stacks*, &c. the Husband-man reserve all he can of the bottom, offal and shakings, and to mingle it with *Chimney-foot* and *Blood*, and with that to reduce it into the consistence of a paste: To this add as much dry'd *Neats Dung*, temper'd with *Urine*, and made up in cakes as big as household loaves, and after all is well dry'd in the shade, crumble them to dust, to be sifted or sprinkl'd on the ground for a very considerable improvement.

Of like effect is Earth blended with *Malt-dust*, or putrified and decay'd *Corn* reduc'd to Meal; so is the dust of old *Fur-bushes*, (in *Devonshire* call'd *Dress*;) but this last should not be taken in Seed-time, lest it infect the Ground with a Plant not easily extirpable.

*Lastly*, The *Mud* of Ponds and stagnant waters of ditches, shovl'd

up, and well air'd, is best apply'd to Roots of Trees, but especially the dust of unstonny high-wayes, where the drift of Cattel, and much passage is : Let it be carried off from *March* to *November*; for it being already a kind of refined Soil continually stirr'd and ventilated, there is no Compost preferable to it for any use : It is prepar'd in the highest degree, and will need no wintering, but may be us'd immediately ; and so may *straw*, *hauilm*, and other *littiere* traml'd on in dirty streets, after it is a while rotted and mingled.

Thus with no little industry are found out the several kinds of Composts, and materials of improvement, and what is the most genuine and true medicament of every Soil for *Arable*, *Pasture* or *Garden*. I do not say all, or as if there were no more ; for what if indeed there should be as many sorts



sorts of *Composts*, as there are of *Ferments* or *Salts*; and as many sorts of *Salts* as there be of *Vegetables*, or any other putrifiable matter? The more there be, the greater ought to be our industry and skill to be able to distinguish them, and to know how and when rightly to apply them.

Nor is it sufficient to consider the nature of the Earth, Mould, and several *Composts*, but of the very Plants themselves, for the application of what you administer, be it for Food or Medicine; as if they be cold of Constitution, to make use of the hotter *Composts*; if hot, to prescribe the cold: For instance in a few of the most useful only:

*Fruit-Trees* do generally thrive with the soil of *Neats* and *Hogs*; most *Flowers* with that of *Sheep*, but especially *Roots*. *Peter Hondius* tells us (in his Book intitl'd *Dapes inemptas*) that by the sole

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application of *Sheeps-Dung*, he produc'd a *Reddish-Root* in his Garden as big as half a mans middle, which being hung up for some time in a Butchers shop, people took for an *Hog*.

*Apples* affect a pretty rich soil, with a dash of *Loam*, but they will bear even in *Clay* well soil'd, and mix'd with *Chalk*, especially the more winter fruit; and in *Chalk* alone for some years, but they produce, though sweet, not so large Fruit: But both *Apples* and *Pears* have a better relish in Grounds that are not over-moist, and where they may stand warm, and the last will prosper well enough where the soil is mixt with *gravel*, and has an harder bottom.

*Cberries*, Summer and Stone-Fruit, such as have their Roots like thrumbs, desire a fine light Mould, *Sand* or *Gravel*, with *Chalk*, and good Compost, unless

less it be very coarse and stony, in which case it would be well soil'd, and the pit you plant in, fill'd with rich Mould, as far as the Roots likely use to extend before they reach the *Gravel*, so as to make good spread; and this to be renew'd every third or fourth year; and for this reason it is profitable sometimes to bait steril Grounds, by laying your Composts at reasonable intervals, thereby to tempt and allure the Roots towards it, and keep them from wandering, which they will be subject to do in search of fresh nourishment: For to bear constantly well, and much, *Fruit-trees* must have frequent *letatitions*. Nor are we to judge, that what is excellent Ground for one sort, is so for another, since that which is perfectly good for Corn, is not so for all Fruit-Trees, and slender straw will be fed and brought up with a great deal less

substance and virtue, than what will serve to furnish the stem, bulk and head of a fertile and spreading Tree.

*Vines* (than which there is no Plant more sensibly retains the different qualities of Earth, or whose juice is of more variety) rejoices in light, but vigorous, Mould, rather *Sandish*, and inclining to dry, than either fat, luxurious or moist. *Lime* temper'd with *Blood*, exceedingly recreates it, after the first accidental heats are pass'd over.

The *Fig-tree*, (though affected to dry Grounds) is no lover of *Stercoration*, yet in some Countries they apply *Oyl-Olive* and *Doves-dung*, to cause them to bear early fruit; but omitting the *Oyl*, if the Dung be mingl'd with *Lime* and *Ashes*, it is not to be reprov'd.

*Artichokes* thrive exceedingly with *Sheeps-dung*, which apply'd  
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to the Roots make them produce very great heads.

*Melons, Asparagus*, and most hasty growers, participate evidently of the Soil; and therefore we have already shew'd, how new and heady dung contaminates; and this is (amongst other) the reason why in the more Southern Countries (where they are planted in the natural and unforc'd Mould) they are so racy and superiour in tast and flavour to ours. I should therefore recommend the use of *Sheeps-dung*, well reduc'd, or rather the ashes of burnt *straw*, and the hotter dungs *calcin'd* for some tryals to reform it; or, as they do in *Italy*, mingle Dust and Earth manur'd with *Sheeps-soil* and *wood-ashes*; if after all we have said, the cause of our application of Composts and Dungs to these rare and choice productions, be only to prevent the rains only; for otherwise

otherwise too rich Soils impair the most delicious Fruits, rather than improve them; and *Grapes* and other Fruits are sooner ripened which stand near the Highways, much beaten by passengers, than by all that you can lay to the Roots, or spread on the Ground for that purpose, the *Dust* investing both the Tree and Fruit with a kind of refin'd soil, mellow'd with the dews and gentle showers which fall from Heaven.

To give some instances; *Roots*, as we have shew'd, desire deep Ground; *Fruit-trees* not so, which should never go deeper than the usual penetrations of the Sun; for no farther is the Mould benign: Besides that they but too propensely sink of themselves, especially *Bulbs* of *Flowers*, whose fibers freeing their bottoms, draw them down, and then they change their artificial and accidental

dental beauty, and (as we call it) degenerate; but *Trees* will grow and thrive, if planted on the very surface, with little covering of Mould, so it be oft refresh'd and establish'd against the wind. Besides, we find, that even the goodliest *Fruit* (as well as some *Timber-Trees*) have many times the hardest footings, with reasonable depth of Earth: So little does it import to have it profound; and therefore in soft and deeper *Sands*, they thrive nothing so well, as on *Chalk* and *Gravel*, so long as the root can be kept from descending; in which case you should (as we shew'd) bait the Ground towards the surface, and keep the roots from gadding too far from the stem; for the lower roots are frequently starv'd by the upper, which devour the nourishment before it arrive at them.

To give some other profitable instances



instances of this nature ; In *Transplanting Trees* (beginning early, and when the Earth is most tractable) endeavour to make your Mould as connatural to that of the place or nursery from whence you remove them, as you can. 'Tis not therefore material, it should be so much richer ; but where *Imp-Gardens* are poor, the tender Plant (like a Child starv'd at Nurse) does seldom thrive where ever you set them ; and therefore they should have fair and spreading roots, and be well fed, what ever some pretend. For other rarer shrubs and Plants, the *Orange* (*Herrera* tells us) thrives well with the *ashes* of burnt *Gourds* and leaves, and needs not change of Mould, even in the *Case*, above twice a year, and that towards the surface ; but *Amomum Plinii* is a strange waster of Earth, and should continually be enrich'd and planted

as it were all in dung ; so the *Myrtil* and *Pomegranat*, whilst the *Red-rose*, *Capers*, *Sampier*, and other Shrubs and Plants thrive better in *Gravel* and rubbish; *Sage* with ashes, and so *Porcelan* with dust and sweepings: *Rue* affects the dry Mould, *Lettice* the moister ; *Flowers* for the most part detest the Dunghill, but if any, that of *Sheep* or *Neat* mixt with *Loam* and light *Earth* : *Tulips* delight in change, and rather in poor than rich Mould ; yea, sharp and hungry to preserve their variegations : But because 'tis sometimes troublesome to transplant them yearly ; place a layer of short *stable littier* a foot beneath your Mould, and you will find they may remain unremov'd for some years without prejudice. The *Iris* loves the dry beds ; *Crocus*, a mixt, rich and light soil : *Carnations* would have a *Loamy Earth*, qualified, if too stiff, with *Sea-sand*,

*Sea-sand*, and *Sheeps dung*; if too poor, with richer Mould; so the *Peöny*, *Anemony*, *Ranunculus*, and other Flowers; but then lay it at the bottom, such as you take from the last years *Hot-bed*, giving it a surface of under-turf, which has been foder'd on, sweet and air'd : In this to plant your Roots, but so as not to touch the Soil, but rather let it lie about the Pasture-Earth, in which your *Bulbs* should alwayes be planted : For all dung'd Earths canker the roots of *Flowers*, whilst their fibers, reaching the heartier Mould, draw from it without danger. But if you would indeed be provided of excellent Earth to plant most *Flowers* in, lay turf of Pasture-ground in heaps for two Winters, till it be perfectly consum'd : This is also admirable for *Tuberous* roots, and indeed all up-land-mould, whether *Sandy* or *Loamy*, may be

be made perfectly good with *Neats-dung* laid on the surface about *Michaelmas* for one year, that it may wash kindly in; then in *September* after, pare this turff off as thin as you can, and for the first foot depth of Earth, you have bedding for *Bulbs* and *Tuberous* Roots superiour to any other. Another proper mixture (much in esteem with our Gardeners) is hollow *Willow Earth* a fourth part, sifted from the grosser sticks, with almost an equal portion of *Sheeps-dung* (*Lauremberg* says, *Goats* is better) with a little natural Mould; and indeed this is excellent to raise any seedlings of *Flowers*; but for the more minute and delicate, such as *Cypress*, *Mulberie*, the *Samara* of *Elme*, and the like, prepare a Mould almost of powder, gently refresh'd with a dewie *sperge* or brush, not with the watering-pot, which plainly gluts it.

*Auri-*

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*Auricula, Anemonies, &c.* should be raised in the *Willow-mould* describ'd above, but planted forth where *Neats-dung* and *Loam* is sifted among the pasture Earth.

The *Pine* and bigger *kernels* make great advance by being coated with dung, which being grown to great Trees abhor it. Touching change of *Crop*, something has been said already, and *Pease* degenerate betimes, at least in two or three years, be the Land never so good; so 'tis observ'd, that most Plants long standing in the same bed, impair both the Ground and themselves, especially *Sorel*.

To Conclude; for a general good *Garden-soil*, take the natural under-turff, if it be not too stiff; add to it a quarter part of *Neat* or *Sheeps-dung* perfectly consum'd; one bushel of *seek'd lime* to each load of Mould, with some

some sweet, though rotten *Wood-pile* or *Willow-Earth*, mix it well together; and you have a choice composition for all your rare *Exotics*, *Oranges* and *Cafe-shrubs*; remembring to place the sprag of rotten bavins, hampers or baskets, to keep the Mould loose, with *Lime-stone*, *Brick-bats*, *Shells* and other rubbish at the bottom, that the water may pass freely, and not rot the fibers: And therefore be careful never to make your *Cases* close below, but rather so *barr'd*, as to be able to keep the course materials from dropping through, whilst auger-holes (though never so thick boards) are apt to be stop'd up, and then your roots do certainly rot, and your trees grow sick. The same is to be observ'd in *Pots*, and that you place them about an inch from ground, that they may freely drain, and as freely receive refreshing. But I must not quit these curiosities,

to speak of the cooler Composts, till I have describ'd the best *Hot-bed* that I know of.

Dig a Pit or *Fosse*, *hot-bed*-depth, four foot is sufficient, and of what figure and dimension you think will best entertain your furniture for it; if it be twenty foot in length, and ten foot broad, I think it competent: Line the sides with a wall of brick and half thick; fill this pit with fresh soil from the stable, trodden as other *hot-beds* are, but without any Mould at the surface. In *this* place *Woodden-Cases*, made like Coffins, (but not contracted at the extrems, nor lidded) of what length and breadth you think best, but not above a foot in depth; let these be Dove-tail'd, with wooden handles at each end, to lift in and out, and lastly, boar'd full of auger-holes at the bottoms: Your *Cases* thus fitted, fill them with proper Mould,



Mould, such as you would sow *Melon-seeds* in, or any other rare Seed, and thus place them in your bed of dung. The heat will pass kindly through the perforations, and continue a cherishing warmth five times as long as by the common way of *Hot-bed*, and prevent you the trouble of making new and fresh; for, the whole process of the *Melon*, or what other of choicer Plants, require more than one removal: The heat of this bed continues eight or ten weeks without need of repairing, and if it should, 'tis but casting in some fresh-made soil and *littier*, beneath, and about your Cases, of which some you may glaze *Cheveron-wise* at the top, and with spiracles or casements, to refresh, and give them Air and Sun at pleasure. And these *Beds*, where you cannot conveniently sink them for want of depth, because of water,

you may build above ground as well; and you may, or may not extend a Tent over it, to keep out Rain, Wind and Sun, according as you find occasion. But thus have you a neat and useful hot-bed, as I have been taught to make it by the Right Honourable, the late Lord *Vicount Mordant* at *Parsons-Green*, whose industry and knowledge in all hortulan Elegancies requires honourable mention.

And now at last I am come to set down the several wayes of preparing *Composts* of *Dungs*, and those other ingredients we have mention'd, and begin with the rudest, as that which best accommodates to the grosser part of Husbandry (which yet requires a special maturation) and so descend to the more refin'd: And these I distinguish into the *moist*, the *dry*, and the *liquid* for *Irrigation*. But first, here by the way

way greatly to be reprov'd is the heaping of a deal of indigested soil, and other trash, expos'd (as commonly we find it) to the heat of the Sun, continual rains, and drying winds, as it lies in the wide field, without the least coverture or shade; by which means, all the virtue is drawn forth and carried away, leaving little more than a dry and insipid congestion of *Caput Mortuum*, and perhaps a florid green Circle, or *Fairy-Dance* at the bottom, which the impregnated rains have enrich'd with what it has wash'd from the heap; wherefore to prevent this, and make one load of our prepared Soil worth ten of it:

Cut a square, or oblong *pit* of thirty or forty foot in length, at the least four foot in depth, and ten foot over, or of what dimensions you think will suffice to furnish you with store: Let one of the sides or edges be made so slo-

ping as to receive a Cart or Wheel-barrow to load and unload easily; let the bottom and sides also be so well pav'd, or laid with a bed of small *Chalk*, *Clay*, or the like, that it may be capable of retaining water like a Cistern: If to this you can commodiously direct any channels or gutters from your Stable, and other sinks about the house, it will be much the better. The *Pit* thus prepar'd, and under covert (for that I should have premis'd) so as at least the down-right rains may not fall upon it; cast into it first your *Stable soil* with the *littier*, a foot or more thick, according to the depth of your *Pit*; upon this lay a bed of *fine Mould*, on that another bed of *Cider-Marc*, *rotten fruit*, and *Garden offal*; on this a couch of *Pigeons* and *Poultry-dung*, with more *littier*; then a stratum of *Sheeps-dung*, a layer of *Earth* again, then *Neats-dung*;

*dung*; lastly, *Ashes*, *Soot*, *Fern*, (a moist and a dry) bottom of *Wood-stack*, *Saw-dust*, dry scowrings of *Ponds* and *Ditches*, with all other ingredients, as you happen to amass them, till the *Cistern* be full and heaped up; upon all this cast plentiful water from time to time, which if you can have out of some *Pond* where *Cattel* use to drink and cool themselves in, it will be excellent: At the expiration of two years you may confidently open your magazine, and separate the Layers as they rise, to cast them into other small *Pits* or receptacles made a little concave to receive them; where you may stir, air, mingle and work them in with fresh Mould, or one with the other, as you find cause, till they become comparatively sweet and agreeable to the scent: Lastly, you may pass them through a *screen* made of lathes plac'd at

moderate intervals, and with the liquor remaining in your great Cistern sprinkle the several Composts, and make them up for use, casting the course remaining stuff, which would not pass the riddle, into the Cistern again for farther mortification, and so keep your Pit fill'd with fresh materials from time to time after the same method.

There are some who advise us to suffer your mixture to remain till it be quite dry, after it is thus refin'd, and then being beaten to dust, to strew it upon the ground. And indeed this seems in *Pliny's* time to have been the Custom; nor do I contradict it, provided you could water it, or were sure of a shower before the Sun had drank too deeply of the spirit and vigour of it, which, reduc'd in this manner, it does easily part withall.

Now the Reason of our thus treating

treating *Compost* of various soils and substances, is not only to dulcifie, sweeten, and free them from the noxious qualities they otherwise retain, and consequently impart, apply'd, as usually we find them, crude, indigested and unactive; but for being immoderately hot and burning, or else rank, and apter to ingender vermine, weeds and fungous excrescences, than to produce wholesome Plants, Fruits and Roots fit for the Table, and grateful to the Palate; for which effect, it should be thoroughly concocted, air'd, of a scent agreeable, and reduc'd to the next disposition of a sweet and natural Earth, short and tractable, yet not so moderated as to lose any of its value. The proper season therefore for this work, is the beginning of the Autumnal *Æquinox*, and wind westerly, both to prepare and lay it on your Land; that, whether it be  
of



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of wet or dry consistence, it may have a gentle soaking into the Earth. As for fresh Dungs, such as *Sheep* make when they are folded, it is good advice to cover it with Mould as soon as possible, before the Sun have over-dry'd it, for the Reasons before hinted; and by this early application you will find all that is stiff and yet any wayes contumacious, subdu'd, and perfectly prepar'd before you turn it in. If you would meliorate Ground for *Fruit-trees, Roots and Esculents* of the *Orchards and Olitory Garden*, be cautious, that the hotter Dungs approach not immediately to their stems or roots, without such a circumposition of natural Mould as we have commended. But this is a note for such as think fit to use the soil steaming as it comes from the heap; but if it be prepar'd as we have shew'd, there is no danger  
even

even of immediate contact ; And the same is to be observ'd in *Ab-laqueation*, where we find cause to *bare* the Roots of Trees, and expose them to the air, for fresh influence, or to abate exuberances ; and that the cavity be not fill'd all at once (when we conceive the Roots have been sufficiently air'd ) but gradually from month to month, as from *October* till the beginning of *March* ; and upon other occasions, leaving the surface rough, rather than too compt, and exquisitely trim'd, if only you dig your Ground ; which once in two or three years, four or five, (as you perceive your Trees to require Culture,) is advisable, and then to mingle the Earth with a thorow soiling, and refresh it with the impregnate water of your Cistern, will exceedingly recover a worn-out Plantation. This *Irrigation* may also be yearly

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ly given to the Roots of your *Fruit-trees* about *June* and *July*; and the spreading of a little good Soil upon the surface, and rough chopping it in with the spade before winter, is good husbandry, to wash in amongst the Roots, and to draw them upwards, the shallow running of which is of so great importance.

And thus having shew'd how to prepare, ripen, separate and apply the several *Composts* (which for distinction sake we call the *dry mixture*;) I am next to describe the *liquid* in many particulars, not much differing from the former Process.

Twixt East and North erect a *Pergola* or *Shed*, so contriv'd with a cover, as to exclude or admit the rain, snows and weather at pleasure; sink a Pit for the *Cistern* as you did the former under it; cast into it all the acid Plants, bitter and rank weeds that come  
in

in your way, and grow in the neglected corners of your grounds, such as *Esula*, *Hemlock*, *Docks*, *Thistles*, *Fumary*, *Tabacco-stalks*, *Wormwood*, *Cabbage-leaves and stalks*, *Aconites*, the leaves, trash, and offal, such as Cattel will not touch; to these add *Pigeons* and *Poultry dung*, with their *Quils* and *Feathers*; any sort of *Asbes*, *Soot*, *Hogs-hair*, *Horn*, *hard bones*, such as the dogs have gnawn; also *Urine*, *Blood*, *Garbage*, *Pickle*, *Brine*, *Sea-water*, (if conveniently to be had,) otherwise *Pond-water*, to sprinkle it with, and keep it moist to accelerate putrefaction; but when all is well consum'd, forbear the pouring on of insipid liquors, and thus leave it till it be dry; then air, mingle and work your *Compost* as you were directed above, or boile it into *Peter*, casting what you find not well digested into the *Cistern* again for another year, and with  
a little

a little addition, it will give you half the quantity of the former, and, provided that you supply the Magazine, a continu'd and farther increase. Indeed this *Salt* and *Compost* is not immediately fit for use, till it be well dulcified and purg'd from its over acrimony, therefore mix it well with your Mould, and dilute it as you see cause. The *Receipt* is set down by old *Glauber* for the effecting of wonderful Vegetation, by the assistance of certain *Circulatory Vessels* to prepare the *Oylie Succus*, and pinguid Juice, which that Author teaches in his *Miraculum Mundi*, to extract not only out of these Materials, but out of *Turf*, *Wood* and *Stone* it self, by *calcining* and burning them in close and *reverberating* furnaces, to which a *Tube*, adapted near the bottom, may convey the spirits into a *Recipient*, as he describes the Process. I mention

tion this the rather, for the real effects which I have been told of this *Menstrue* from very good Testimony : And doubtless he who were skill'd to extract it in quantity (and to dulcifie, and qualifie it for use,) a true *spirituous Nitre* may do abundantly more, in the way of the improvements we have celebrated, with a small quantity, than with whole loads, nay, hundreds of loads of the best and richest *dry Composts* which he can devise to make. But besides this, any houses of *Or-dure*, or rancid mould, strong salts, *vinous liquors*, *Urine*, *Ashes*, *Dust*, *shovelings* of the *kennel* and streets, &c. kept dry, and cover'd for three or four years, will be converted into *Peter*, without half this trouble; especially if you mingle it with the dung of *Pigeons*, *Poultry*, and other salacious Fowl which feed on Corn : Or those who would not be at the

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the charge of distilling for these advantages, may make experiment of the so famous *Muck-water*, not long since cry'd up for the doing wonders in the field: Throw of the shortest and best *Marle* into your Cistern, exceedingly comminute and broken, which you may do with an iron Rake, or like Instrument, till the liquor become very thick; cast on this the dung of *Fowl*, *Conies*, *Sheep*, &c. frequently stirring it; to this add the soil of *Horses* and *Cows*, *Grains*, *Lees* of *Wine*, *Ale*, *Beer*, any sort of beverage, *broths*, *brine*, *fatty* and *greasy stuff* of the *Kitchen*; then cast in a quantity of *Lime*, or melting *Chalk*, of which there is a sort very unctuous; also *blood*, *urine*, &c. mixed with the water, and with this sprinkle your Ground at seasonable times, and when you have almost exhausted the Cistern of the liquid, mingle the



the residue with the grosser Compost of your Stable and Cow-house, and with layers of *Earth*, *Sand*, *Lime*, S. S. S. frequently moistned with uncrude water, the taking up of which you may much facilitate, by sinking a Tub or Vessel near the corner of the Cistern, and piercing it with large holes at the bottom and sides, by which means you may take it out so clean as to make use of it through a great *Syringe* or watering Engine, such as being us'd to extinguish fire, will exalt and let it fall by showers on the Ground, and is much the more natural way of irrigation, and dispatches the work.

This Liquor has the reputation also for insuccation of *Corn*, and other Grain, to which some add a fine sifting of *Lime-dust* on it, and when that is dry, to repeat it with new infusions and siftings : But

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There

There is yet a shorter Process, namely, the warring with *Fish-mongers-wash*, impregnated with the sweepings of Ships and Vessels trading for Salt, adding to it the *blood* of the Slaughter-house, with *Lime*, as above; but this is also much too fierce for any present use, till it be perfectly diluted, which is a caution indispensably necessary, when ever you would apply such powerful affusions, lest it destroy and burn up, instead of curing and enriching. Another take as follows:

*Rain-water* of the *Equinox*, q. s. boil'd with store of *Neats dung*, till it be very strong of it, dissolve one pound of *Salt-Peter* in every pottle of water; whilst this is a little tepid, macerate your seeds for twenty four hours, dry them gently, rather with a cloth than by the fire; sow in the barrenest Earth, or water Fruit-trees with it, for prodigious effects. Or thus:

Take

Take two quarts of the same water, *Neats-dung*, as before, boil'd to the consumption of half, strain it, casting into the percolation two handfuls of *Bay-salt*, and of *Salt-Peter ana*. Another:

Take Rain-water, which has stood till putrified, add to it *Neats*, *Pigeon*, or *Sheeps-dung*, expose it for Insolation a week or ten dayes, then pass it through a course strainer, infuse more of the same soil, and let it stand in the Sun a week longer, strain it a second time, add to it *Common-salt*, and a little *Oxes Gall*, &c. Another:

Take *quick Lime*, *Sheeps dung* at discretion, put into Rain-water four fingers eminent; to ten pints of this Liquor, add one of *Aqua-vita*, macerate your Seeds, or water with it any lean Earth, where you would plant, for wonderful effects.

Infuse three pound of the best

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Indian

*Indian Niter* in fifteen Gallons of water, irrigate your barren Mould; 'twas successfully try'd amongst *Tulips* and *Bulbs*, where the Earth should by no means (as we have said) be forc'd by Composts. But a gentler than either, is,

A dilution of *Milk* with *Rain-water*, sprinkl'd upon unsleckt *Lime*, first sifted on your beds, and so after every watering the *Lime* repeated.

These, with divers more which I might superadd, not taken and transcrib'd out of Common Receipt-Books, and such as pretend to Secrets, but most of them experimented, I thought fit to mention; that upon repetition of Tryals, the curious might satisfie themselves, and as they have opportunity improve them, whilst perhaps, as to irrigations, less exalted liquors were more natural. And what if Essays were made

made of Liquors *per Lixivium*, the Plant reduc'd to ashes; might it not be more connatural, since we find by more frequent tryal, that the burning of *stubble* before the Rains descend on it, impregnates ground by the dissolution of its spermatic salts? I only name the naked *Phlegm* of Plants distill'd either to use alone, or extract the former salt; but I say, I only mention them for the curious to examine, and *ex abundanti*. For certainly (to return a little, and speak freely my thoughts concerning them) most exalted *Menstrues*, and (as they dignifie them with a great name) *Essentiated Spirits*; I say, all hasty motions, and extraordinary fermentations, though indeed they may possibly give suddain rise, and seemingly exalt the present vigour of Plants, are as pernicious to them as *Brandy*, and hot-waters are to Men; and there-

fore wherever these ardent Spirits are apply'd, they should be pour'd at convenient distances from any part of the Plant, that the virtue may be convey'd through some better qualified medium. But when all is done, waters, moderately impregnated and imbodied with honest *Composts*, and set in the Sun, are more safe, and I think more natural : For, as the Learn'd Dr. *Sharrok* truly affirms, Water is, of its own Constitution alone, a soil to Vegetables, not only as the most genuine *Vehicle* of the riches which it imparts to Plants, through the several strainers, and by means of which all change and melioration is effected ; but for that it is of all other substances best dispos'd for ingression, to insinuate into, and fertilize the Earth, which is the reason that floated and irriguous grounds are so pregnant. Besides, it is of all that pretend

pretend to it, nearest of blood (as I may say) to the whole *Vegetable* Family: For to assert with any confidence, what part of the meer Earth passes into their composition; or whether it serve (as we touch'd before) only for stability, or as a womb and receptacle to their *Seeds* and *Eggs* (for so we are taught to call the *Seeds* of Plants,) I shall not undertake to discuss. Every body has heard of *Van-Helmonts* *Ash-tree*; and may without much difficulty repeat what has been experimented by exquisitely weighing the Mould before, and after a *Gourd* is planted in it, and till it be grown to bulk and full maturity, fed with water only; how much liquor is insum'd, and how little of the Earth consum'd, to make some conjecture; though I do not yet conceive the Earth to be altogether so dull and unactive, as to afford no other aid



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to the Generation of what she bears; the diversity of soils being (as we have shew'd in this Discourse) so infinitely various, and the difference of invisible infusions so beyond our Arithmetic. But if we give *Liquids* prædominion, and at least the *Masculine* preference, be they *Salts*, or *Spirits* (that is, nitrous Spirits) convey'd into her bosome how they will; sure we are, that *Water* and *Vegetables* are much nearer of alliance, than either *Water* or *Air* are with the Earth and Mould. But neither do I here also by any means exclude the *Air*, nor deny its perpetual Commerce, and benign influences, charg'd as it comes with those pregnant and subtil particles, which insinuating into the Earths more steady and less *volatile Salts*, and both together invading the *Sulphur*, (and freeing them from whatsoever they find contumacious)

contumacious,) that intestine fermentation is begun and promoted, which derives life, and growth, and motion to all that she produces. That by the *Air*, the most effete and elixivated Mould comes to be repair'd, and is qualified to attract the prolific nitrous spirits, (which not only disposes the Earth to this impregnating magnetism, but converts her more unactive and fixed salts into quite another genius and nature,) the Learned Doctor Mayow has ingeniously made out; and all this by a naked exposure to the *Air* alone, without which it produces nothing: Nor can *Plants* (totally excluded from the *Air*) live, or so much as erect themselves to any thriving purpose, as being depriv'd of that *breath* and vital *Balm*, which no less contributes to their growth and nourishment, than does the *Earth* it self with all

Treat.  
Medico-  
Phys.

all our assistances : For that *Plants* do more than obscurely *respire*, and exercise a kind of *Peristaltic* motion, I little doubt, from the wonderful and conspicuous attraction, and emission, which some of them discover ; particularly, the *Aloes*, and other *Sedums*, and such as consisting of less cold and viscous parts, send-forth their aromatic wafts at considerable distance.

Besides, we find that *Air* is nearer of kin and affinity to *Water*, than water is to *Plants*, unless I should affirm, that *Air* it self were but a thinner water ; for how else are those *Vines*, and other Trees of prodigious growth, maintained amongst the barren Rocks, and thirsty *Pumices*, where Rains but seldom fall ? if not from this rorid Air. Not to insist again, that perhaps even these Rocks themselves may once have sprung from liquid  
Parents,

Parents ; and how little, even such as are expos'd to continual showers in other Climates, abate of their magnitude, since we rather find them to increase ; and that also the Fruits and Juices of *Vegetables* seem to be but the concretion of better concocted *Water*, and may not only be converted into *lignous* and woody substance (as the Learned Doctor *Beale* has somewhere instanc'd in a Discourse presented to You, and Recorded in the *Public Transactions*) but is apt enough to *petrifie* and become arrant stone.

Whatever then it be which the *Earth* contributes, or whether it contain universally a *Seminal* virtue, so specified by the *Air*, *Influences*, and *Genius* of the Clime, as to make that a *Cinnamon Tree* in *Ceilon*, which is but a *Bay* in *England*, is past my skill to determine ; but 'tis to

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to be observ'd with no little wonder, what *Monsieur Bernier* in his History of the *Empire* of the *Magol* affirms to us of a Mountain there, which being on one side of it intolerably hot, produces *Indian Plants*, and on the other, as intemperately cold, *European* and *Vulgar*. Not here to pass without notice at least, what even the most exhausted Mould will (to all appearance) produce spontaneously, when once it has been well expos'd to the Air, and heavenly influences; if what springs up be not possibly from some volatil rudiments and seeds, transported by winds, higher than we usually place our Experiments, unless we could fix them upon *Olympus* top: But *Porta* tells us with more confidence, that he took Earth from a most profound and dry place, and expos'd it on such an eminence,

nence, as to be out of reach even of the winds; but it produc'd, it seems, only such Plants as grew about *Naples*, and therefore may be suspected.

To return then again from this digression, and pursue our *Liquids*; where there is good *Water*, there is commonly good *Earth*, and *vice versa*; because it bridles and tempers the *Salts*, abates the acidity and fierceness of *Spirits*, and imparts that usefull ligature and connexion to the Mould, without which it were of no use for Vegetation. In the mean time, of all *Waters*, that which descends from Heaven, we find to be the richest, and properest in our work, as having been already *meteoriz'd*, and circulated in that great *digestory*, enrich'd and impregnated with *astral* influences from above at those propitious Seasons; whence that saying,  
*Annus*

*Annus fructificat, non Tellus*, has just Title to a Truth we every years Revolution behold and admire, when the sweet Dews of *Spring* and *Autumn* (hitherto constipated by cold, or consumed with too much heat) begin to be loosened, or moderately condens'd, by the more benign temper of the Air, impregnating the prepared Earth to receive the *Nitrous* Spirits, descending with their baulmy pearls, yet with such difference of more or less benign, (as vapours haply, which the Earth sends up, may be sometimes qualified,) that nothing is more uncertain. And this we easily observe from the Labours of the Industrious *Bee*, and her precious *Elixir*, when for some whole moneths she gathers little, and at other times stives her waxen City with the harvest of a few propitious days. But I am gone too far, and there.



therefore now shall set down only a few directions concerning watering, and so dismiss the Subject and your patience.

1. It is not good to water new-sown *Seeds* immediately, as frequently we do, and which commonly bursts them; but to let them remain eight and forty hours in their beds, till they be a little glutted with the natural juice of the Earth.

2. Never give much water at one time; for the surface of the Earth will often seem very dry, when 'tis wet enough beneath; and then the *Fibers* rot about *Autumn*, especially in *Pots* and *Cases*, winter'd in the *Green-house*: To be the more secure, we have already caution'd *Gardeners* to keep their bottoms hollow, that nothing stagnate and fix too long; which should be but transitory. If such Curiosities strike no root by *September*,  
the

the leaves desert them certainly at *Spring* : The reason is want of *Air*, not moisture. Therefore in all intervals of severer frosts, and rigorous winter-weather, be sparing of refreshings, and unless you perceive their leaves to crumple up, and fall, ( which is their language for Drink, ) give them as sparingly as you can. Indeed, during the *Summer*, and when they are expos'd, they require almost perpetual irrigation, and that the liquor be well impregnat'd with proper Compost : But in hard Frosts, or foggy Seasons, watering your housed Plants indangers them by mustiness, and a certain Milledew which they contract. On the other hand,

Applications too *dry* create an intemperate thirstiness, and then they drink unmeasurably, and fall into *Dropsies*, *Jaundies*, *Feavors*, swell, languish and rot; and

and if the liquor prove too crude (as commonly it does, if taken from running and hungry fountains,) it extinguishes the natural heat, and obstructs the Pores; and therefore when ever you are constrain'd to make use of such drink, expose it first to the warm *Sun* for better concoction, infusing *Sheep, Pigeons, or Neats-dung*, to give it body : But though *Spring-water* be so bad, slow running *River* is often very good, and *Pond-water* excellent, so it be sweet ; but all stinking pools, *mineral* and *bituminous* waters, are not for our use ; and often good Air is as needful as good water ; *Worms, Mouldiness, Cankers, Consumptions* and other Diseases, being the usual and fatal consequence of these vices.

If you be to plant in fresh and new broken-up Earth, and that the season or mould be too  
M dry,

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dry, 'tis to be water'd; but then give it a competent sprinkling, or sifting of dry and fine mould upon what you have refresh'd, and then beating it a little close with the back of your spade, plant it successfully; for this you will find to be much better, than to water it after you have planted (as the custom is) and as you may observe in setting *Violets*, *Auricula's*, *Prim-roses*, and other *Capillaries*, planted in beds or bordures, and then dash'd with a flood of water, which, so soon as the *Sun* has look'd upon, resign and lose their tinctures, scorch and shrivel up. Lastly,

For the *Season* likewise of this work, let it be towards the *Evening* in hot and summer dayes, for the reason immediately assign'd; for the moisture being in a short time drunk-up, deserts the Plant to the burning *Planet*;

*Planet*; and hence it is, that *Summer mists* are so noxious, and *Meridian watrings*; and therefore the best expedient is, upon such exigencies, to pour your refreshings rather all over the *Area* on which your *Cases* of choice and rare shrubs are plac'd, and among the *Allees* and *Paths* between your *Beds* of *Flowers*, for the raising artificial *Dews*, (by which is unfolded no common secret;) or water them *per lingulam*, and *guttatim*, than either with the *Pot* or *Bucket*: And after this manner, if at other seasons they stand in need of heat, and comfort of warmth, by strewing *Sand* or *Cinders* on the same intervals, the reflection will recreate them, upon all emissions of the *Sunbeams*.

As for grosser Plantations, and *Trees* of old *Orchard-Fruits*, moderation is also to be observ-

ed, and not to dash-on such a quantity near the stem and body; but first with the spade to loosen the Earth about them, especially towards the extremities of the tenderest Roots, which generally sprout at the ends of the most woody, whose mouths are shut with tougher bark. These therefore may be cut sloping to quicken them a little, and make them strike fresh fibers; especially if some rich and tempting mould be seasonably apply'd: For Trees will (as we shew'd) with very little Earth to cover them, take fast root, (provided you stablish them against impetuous winds, shocks and accidents of force,) and thrive exceedingly with this refreshment.

Some make pretty large holes with an *Iron-Crow*, or (which is better) a pointed stake, and pour the liquor in at those over-  
tures;

tures ; but besides, that by this means they wound the roots, (which *gangrenes*, and sometimes kills the Tree,) if the holes be not fill'd, the Air and Moisture mouldies them : So as, when all is summ'd together, there's nothing comparable to frequent stirring up the Ground, opening the dry clod, and watring upon that ; and if you lay any *fearn-brakes* or other trash about them to entertain the moisture, and skreen it from the heat, let it not be wadded so close, or suffer'd to lie so long, as to contract any mustiness, but rather loose and easie, that the Air may have free intercourse, and to break the more intense ardours of the scorching Sun-beams.

Thus I have exercis'd Your Lordships and these Gentlemens Patience with a dull Discourse of *Earth, Mould and Soil* ; but,  
I trust



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I trust, not altogether without  
some Fruit ; or, at least, not im-  
properly *pro hic & nunc*, as the  
Subject has Relation to what  
has so lately been produc'd, and  
with happy event made out, by  
those Learned Persons, who have  
entertain'd this *Noble Society*  
with the *Anatomy of Plants*.

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*E R R A T A.*

Pag. 49. l. 22. *r. un-uniform.*

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*F I N I S.*

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